

COAL AGE

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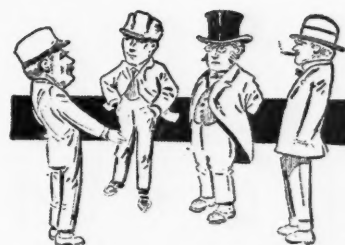
No. 13

The Mainspring

BY BERTON BRALEY

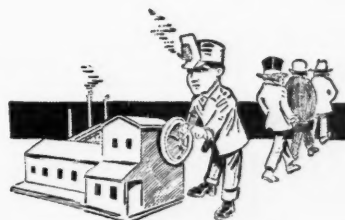
Written expressly for Coal Age

Pitboss an' foreman an' owner an' supe
Sure are a strong an' a heavyweight group,
Swellin' around with a satisfied smile,
Bossin' us miners an' livin' in style;
Still, when you're dealin' with figgers an' facts,
Gettin' right down to the simple brass tacks,
None of these big guns is makin' much flash
Side of the feller who deals out the cash.



A Heavyweight Group

Down in the mine where it's dusty an' dark,
Life ain't no picnic, no regular lark,
Danger is lurkin' all over the place,
There is a plenty of risks we must face.
What do we do it for—pleasure or fun?
No, sir, we work for the sake of the mon,
So when it's payday we all make a dash
Up to the feller who deals out the cash.



They Might Quit the Job

Foremen an' supers an' pitbosses, too,
Might quit the job, but we'd worry it through,
Managers leave an' directors resign,
Still we would manage to handle the mine,
But—if that feller who deals out our pay
Quits doin' business a week or a day,
Down shuts the mine with a clang an' a crash,
Work all depends on the guy with the cash!

So here's to his health, may he never grow pale,
But always have plenty of strength an' of kale,
The bosses an' foremen we mebbe might spare
But the guy with the payroll we foster with care,
We hope he will sit there right tight in his cage
An' slip us each payday a boost in our wage,
We love an' respect him—we never will clash,
With that there fine feller who deals out the cash!



Here's to His Health

The Fushun Coal Field in Southern Manchuria

SYNOPSIS—Some brief notes and a number of views of operations in this interesting district. The seam worked is 120 ft. thick. The pillar and stall system is used and sand filling is being tried.

The Fushun operations are situated about 20 miles east of Mukden, on a branch about 32 miles long from the South Manchurian Ry. There are in all five collieries called the Oyama, Togo, Laohutai, Yangpaipu and

of March, 1907, when both the mine and railway were transferred to the South Manchurian Ry. Co. On acquiring control of the property, this concern instituted an aggressive development propaganda at the Chienchichai, Yangpaipu and Laohutai collieries, incidentally installing a great deal of machinery.

The coal measures belong to the Tertiary, the coal bearing rocks being mostly shales and clay, often carrying numerous fossil leaves. The seams extend east and



THE OYAMA PIT ON THE LEFT AND THE TOGO PIT ON THE RIGHT

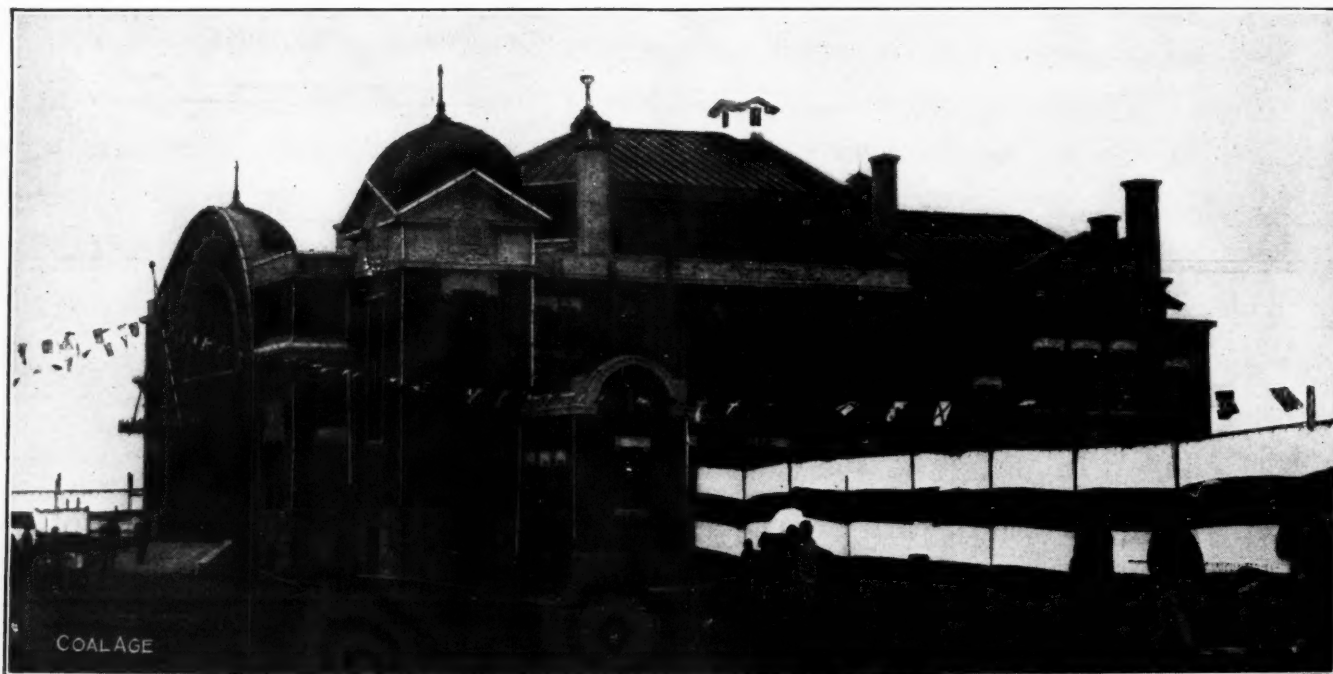
Chienchichai. They are all modern plants in every respect, those at Oyama and Togo being particularly up-to-date. The total production from all five mines aggregates over 7000 tons per day, and there are about 20,000 Chinese laborers employed, together with 1500 Japanese laborers and 500 officials of the same nationality.

The coal in this locality was first worked about 600 years ago by the Koreans, who used the fuel for burning earthenware. On the Chinese occupation of the district, mining was entirely suspended. During the Russo-Japanese war the latter government took possession of the property and worked it on a small scale until the end

west for a distance of nearly 10 miles along the strike and have a northerly dip, varying from 22 to 35 deg. Two seams have so far been discovered, but only the upper one has been developed as yet, the lower being of much inferior quality. The seam worked is 120 ft. thick and has many thin partings.

The coal is of excellent quality, particularly adapted to gas making and locomotive uses. The following is an average analysis: Water, 7 per cent.; volatile matter, 40 per cent.; fixed carbon, 48 per cent.; ash, 4 per cent.; sulphur, 0.8 per cent.

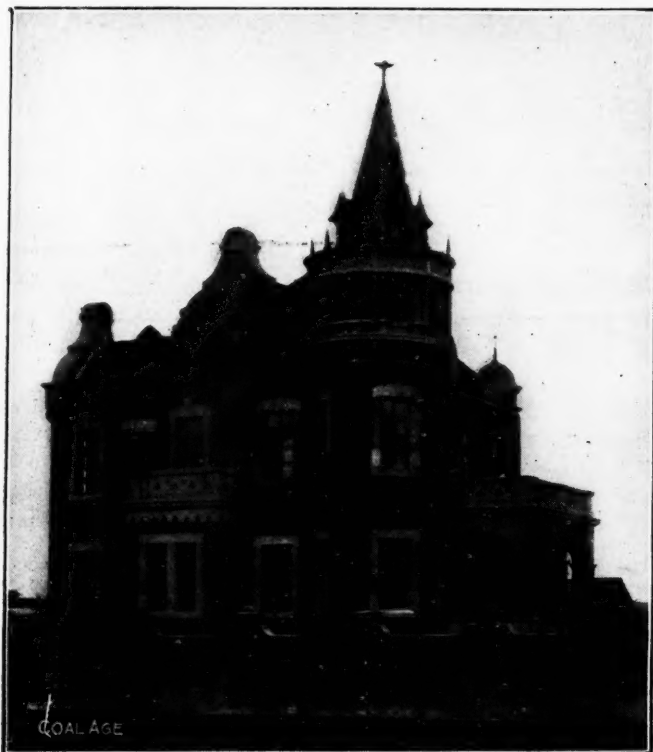
Mining operations so far have been conducted on the



VIEW OF THE COAL COMPANY'S PUBLIC HALL

pillar-and-stall system. Tests are now being made to test the practicability of sand filling. Stripping will also be used shortly, the local engineers crediting this country for turning their attention to this method.

An interesting feature is the great depth to which the



RESIDENCE OF VICE-PRESIDENT N. SAKAGUCHI

shafts are sunk, one being 1160 ft. deep. As a rule, the shafts are of circular section, about 21 ft. in diameter and lined with brick throughout most of their length.

Co-operation between Operating Department and Office

BY H. H. WARNER*

It is a known fact that in any business there has to be coöperation between the various departments, if such business is successfully operated, and the coal-mining business is no exception. In quite a few instances, they lack coöperation between the operating department and the office which handles the details. If we trace this non-coöperation back, it will be found, as a general thing, to result from the failure of the mine manager or the one in charge to get the operating reports into the office in a satisfactory manner.

Of course, the accountant in charge can figure out this work in a way that will make a report which is nearly correct covering the operation, but nearly correct is not what the average coal company wants. In this business especially, every minute detail should be taken care of in a way that would be a positive record, and this can only be done by the mine manager or mine superintendent personally seeing that the requisitions for supplies, materials, time books, yardage books, etc., are absolutely correct before they enter the office to be recorded.

*Chicago, Ill.

At a well operated plant, you will find the mine manager or superintendent taking more or less interest in the various office details, and keeping in touch with all the reports that the accountant turns out, and also an interest in their value. By so doing, he sees where his accountant is going wrong on any one subject, and can at once explain the particular proposition, so that in the future it can be handled correctly.

The last statement pertains mostly to the handling of supplies, material and cost reports. Summing this co-operative plan up means nothing more or less than that the accountant in charge of the office detail at the mine should act as an assistant to the mine manager or superintendent in charge; there are quite a number of mine superintendents today who were at one time mine accountants, and they received their training through co-operating with their superior, who was either mine superintendent or manager.

The mine clerk or accountant's leisure time will be well spent if he devotes it to studying and investigating the operating department, and by so doing he will find that within a short time he will be able to handle more or less of the operating work with considerable intelligence, and that is the first stepping-stone to his success if he expects to stay in the mining business.

He must study mine management in order to coöperate with the operating department. In return, the mine manager or superintendent should study the office work, and, as before stated, should acquaint himself with the value of its detail if he expects to gain the main point—coöperation. By gaining this point, it will not only be a great help to him, but also to the company.

The Western Kentucky Coal Field and Its Relation to the Panama Trade

BY A. BLAIR, JR.*

Among the great mass of data published, speculating upon the possibilities of the American coal operators in the Panama coal trade, it is rather remarkable that the western Kentucky field has been almost completely neglected. This field comprises an area of approximately 4000 square miles. By water transportation via the Ohio River, it is some 600 miles closer to Colon than the West Virginia field; in fact, the western Kentucky district has a distinct advantage in this respect over any of the Eastern coal fields.

In recent issues of COAL AGE the possibilities of water transportation via the Ohio River from the West Virginia fields were mentioned with the comment that this would prove "another great factor" in favor of these fuels. Some remarks were also made on the eastern Kentucky field, but the western districts were apparently ignored.

Of course it is understood that water transportation from any of these interior fields is contingent upon the development of a permanent year-around waterway down the Ohio River. The government engineers are now working on this phase of the problem, and it is only a question of time until a channel with a minimum depth of 9 ft. will be available.

As regards the western Kentucky field itself, water

*Superintendent, Pittsburg Coal Co., Henderson, Ky.

transportation is not an entirely new feature in that district. Previous to the advent of the railroad much coal was supplied river steamers and considerable shipped by these boats to mills and factories scattered along the river. But with the advent of rail transportation these river mines were gradually driven out of their markets. Most of these operations were confined to the banks of the Green River, which traverses practically through the center of the field and has excellent natural loading facilities; this river is navigable the year round. On the Ohio River the government engineers propose making a 12-ft. channel from Louisville, Ky., down, a depth which it will be impossible to obtain above that point. In a channel of this size a thoroughly sea-going barge may be used, thus doing away with the heavy additional charge of re-loading at the gulf ports. It is thus clear that this field will enjoy a distinct advantage over other districts, in this respect at least.

The western Kentucky field consists, essentially, of the southern extremity of the Great Central Basin, which traverses western Indiana and almost the whole of Illinois. The principal seams being worked at the present time are known locally as the Nos. 9 and 11, from which about 8 million tons are being extracted per annum. There is also a lower seam of comparatively high-grade coal, which is exceptionally uniform in occurrence and quality over a wide territory. Owing to its great depth and comparative inaccessibility, it has not been extensively developed as yet.

This seam, known as No. 1, analyzes roughly about as follows: Volatile matter, 17.21; fixed carbon, 74.31; ash, 7.60; sulphur, 0.88. The seam is quite persistent over the greater part of the field, and seems to be comparatively free from faults or other geological disturbances. About the only important development in this section was done previous to the Civil War, and these plants were all destroyed by the union soldiers and have never been rebuilt.

There are other respects in which this district has an advantage over other fields as, for instance, in the labor supply. It is one of the richest farming districts in the country, and as is well known, such sections are always a strong attraction to good men. This is exemplified by the prevailing conditions in the field, no labor troubles or strikes of consequence having occurred in years.

In view of these substantial advantages, which this section has over other competitive districts, it should prove a large, if not the predominating factor, in the Panama coal trade, at least as regards the inland fields. The consummation of the river improvements, coincident with the completion of the Panama Canal and the consequent development of this new market, is regarded as particularly propitious. The district is already being investigated by powerful money interests, and will, no doubt, be the scene of a rapid development in the course of the next few years.

DISCUSSION BY F. R. WADLEIGH

The eastern Kentucky coals cannot reach tidewater on freight rates that will enable them to compete. The western Kentucky field, while accessible by water to Gulf ports, has not the quality of coal required and could only reach a limited market.

Although the No. 1 seam may be a high-grade coal, covering a wide territory, Mr. Blair himself states that

it is not extensively developed, "owing to its great depth and comparative inaccessibility." How much coal is being mined from this seam and on what data does he base his analysis and his statement that the coal "seems to be comparatively free from faults or other geological disturbances?"

The U. S. Geological Survey reports state that most of the workable coal in the western Kentucky field is confined to the Nos. 9 and 11 beds, No. 9 bed being about 300 ft. below the surface and No. 11 about 40 to 100 ft. higher. There is also a No. 12 bed mined in a few places, and Nos. 6 and 5 (so called) furnish a small amount of coal.

The analysis given of this No. 1 coal by Mr. Blair is entirely different from that of other Kentucky fuels, resembling greatly Pocahontas, although higher in ash. We have been unable to find in the Kentucky state reports any coal analysis like it. More knowledge about this seam of coal is desirable, as its large development, if feasible, would put an entirely different aspect on the possibilities of the western Kentucky district. However, it is not believed that the labor-supply question will give this field much advantage over its competitors; the output of coal per man per year in Kentucky is lower than the average for the country.

It is difficult to see why the western Kentucky field should be either "a large" or a "predominating factor in the Panama coal trade, at least as regards the inland fields." It has not at present sufficient tonnage of coals of the necessary quality, nor can these be placed at Colon at a lower price than the Eastern tidewater fuels, after the adjustment of water freight rates on the latter, due to the opening of the canal, takes place.

The extent of the coal markets opened to United States fuels by the Panama Canal has been greatly exaggerated, and there will be the strongest kind of competition for this business by higher-grade coals than any in western Kentucky.

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Electric Cables in Mine Shafts

Mining men recently discussed the question of aluminum vs. copper as a conductor for electric current in mine shafts. It was pointed out that aluminum is stronger than copper, but its conductivity is just about one-half, so that things are evened up. One authority stated that two 0.15 cables in a shaft are better than a single 0.3 cable; the bigger the cable, the stronger the armoring required. Continuity of current supply is the most important factor to be taken into consideration when installing shaft cables.

One engineer suggested that single-core, single-armored cables, put in wrought-iron pipes, take up the least room in a shaft, and the weight of such cables is such that they may be easily handled. The wires and the insulation are in compression instead of tension and less likely to develop faults. Another engineer preferred two separate cables, so proportioned that with one out of use the plant may be kept running till the damaged cable has been repaired. This arrangement serves two important functions—reduction of weight on supports and security of supply. A colliery manager stated that for mechanical strength, the paper-insulated, lead-covered and armored cable is unequaled, and is well suited for either shafts or roads in mines. In the case of twin or multicore cables,

the mechanical strength, as far as the resistance or crushing is concerned, is considerably increased by using sector-shaped conductors.

An electrical engineer told of a case where the shaft cables caught fire. They were bitumen cables and were in the upcast shaft. Coal was hoisted in that shaft for a considerable time before the main shaft was put into operation and much coal dust accumulated around the cables and cleats. There was also a certain amount of moisture in the shaft. One night he was informed that the cables were on fire, although they had no indications on the switchboard; the ground detector did not show anything and no fuses were blown out. They extinguished the fire with water and wet bags thrown around the casing.

They discovered that the fire was from the outside and not from the inside. The ultimate conclusion was that the fire had been caused by electrolysis, and it probably started in a poultice-like mass which had accumulated at the iron bolts. This had evidently set up heat sufficient to cause the casing to start burning.

This experience teaches a lesson relative to the use of wood in a mine shaft. It suggests plainly that all inflammable material should be kept clear of shaft cables.

Shale-Dust Grinding Machines at English Collieries

BY SAMUEL DEAN*

A shale-dust grinding plant is now becoming part of the general equipment at collieries in Great Britain. Figs. 1 and 2 show the Robey plant in use at many collieries, including Altofts and Bentley. There are two sizes, the smaller one for dealing with 8 to 10 cwt. per hour, and the larger 15 to 20 cwt. per hour, the effective hp. required being 14 and 20, respectively.

*Victor-American Fuel Co., Delagua, Colo.

The machine is self contained, the crusher being in such a position that the product falls direct into the granulator. Two separate drives are required. Screens fitted round the granulator can be adjusted to give the correct fineness of dust. The latter is of the revolving type mounted in ring-oiled bearings. There is a hopper under the machine fitted with a door for emptying the shale dust into cars or sacks. The cost of a plant capable of grinding 15 cwt. per hour complete is about \$800.

AMERICAN MILLS USED AT BRITISH COLLIERIES

Ninety per cent. of the shale dust produced will pass through a 100-mesh screen. A number of Griffin mills are being installed and can be seen at collieries in South Wales, and at Denaby and Cadeby Main collieries, in

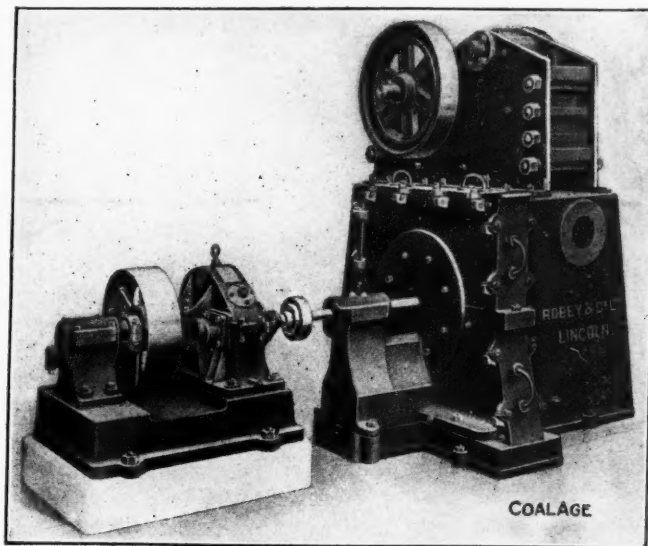


FIG. 1. ROBEY PULVERIZER PLANT WITH INTERMEDIATE GEAR TO REDUCE BELT SPEED

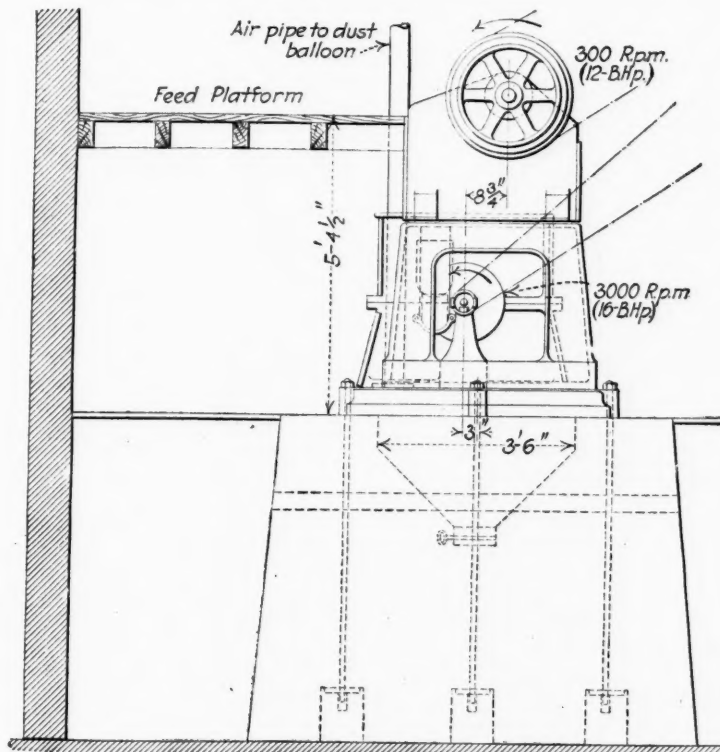
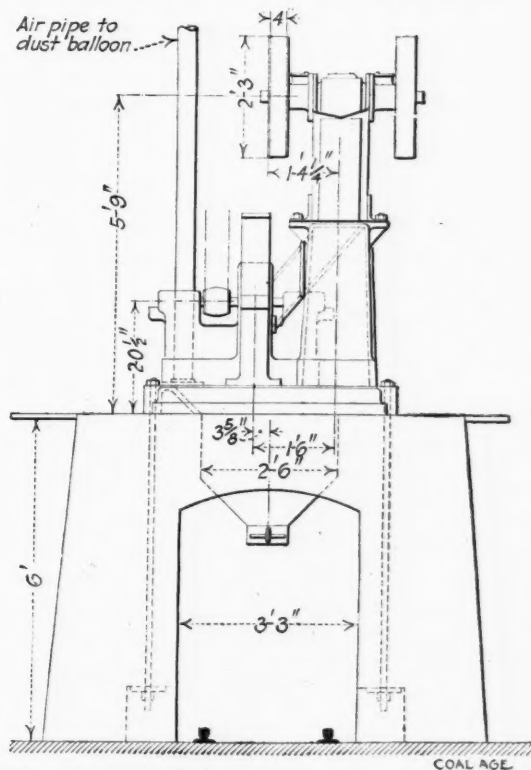


FIG. 2. ARRANGEMENT OF A ROBEY ROCK-PULVERIZING PLANT



Yorkshire. The Griffin mill is built in two sizes by the Bradley Pulverizer Co., of Boston, Mass., and produces a fine floury dust, about 90 per cent. passing through a 180-mesh sieve (180 holes per linear inch). The larger mill produces two tons of shale dust per hour, 55-60 b.hp. being required. The smaller or 30-in. mill produces one ton per hour and requires 25 to 30 b.hp.

The Griffin mill is well known and is in use in all parts of the world, being used largely for grinding the raw materials from which portland cement is made. The grinding is accomplished by means of a roller running

Keesport plant of the National Tube Co., Experimental Mine, Bruceton, and the Harbison-Walker brick factories. Definite arrangements for these excursions will be announced at the meeting.

At 7:30 p.m., a subscription banquet will be held at the Hotel Schenley, the cost of which will be \$3 per plate. Ladies are urged to be present. Business suits will be worn by men.

Following are some of the papers which will be read at the Saturday morning session, beginning 9:30: "A Test of Centrifugal Motor-Driven Mine Pumps," by S. S. Rum-

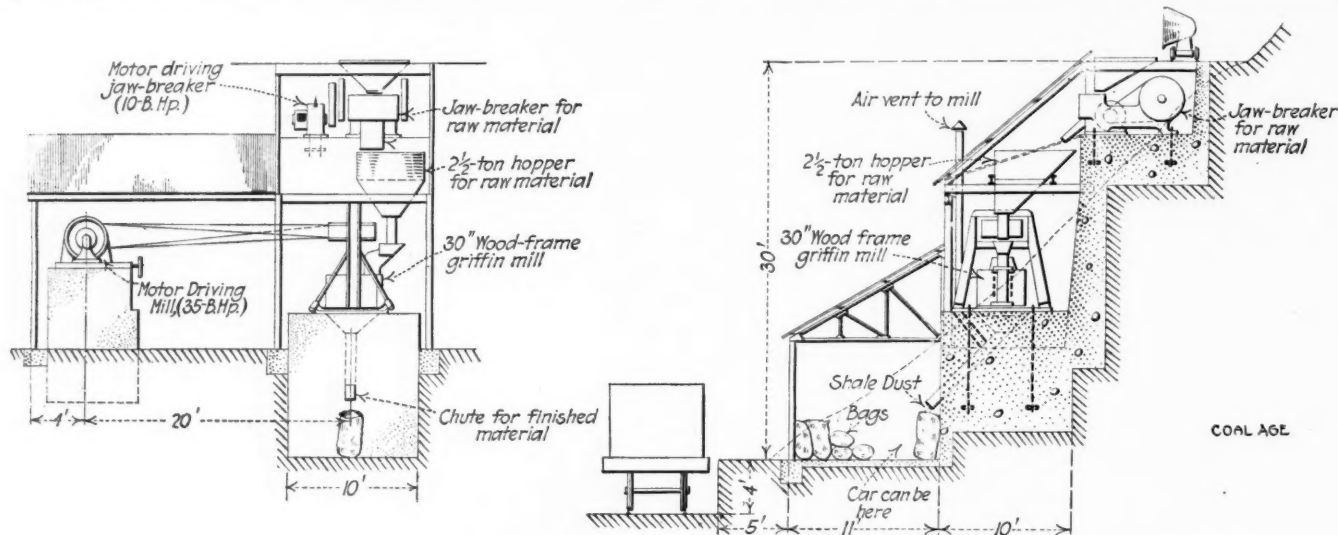


FIG. 3. A 30-IN. GRIFFIN MILL FOR GRINDING ROCK INTO DUST AS INSTALLED IN BRITISH COLLIERIES

within and against the inner surface of a die ring, being held in contact with it by centrifugal force. A 30-in. mill costs about \$2000 and a 40 in. about \$4000.

Coming Meeting of American Institute of Mining Engineers

The Pittsburgh meeting of the A. I. M. E. will be held Oct. 8, 9 and 10. The headquarters in Pittsburgh will be at the Hotel Schenley. There will be no formal program on Thursday morning, the first day of the convention. In the afternoon, however, a number of papers will be read, among which will be "Investigations of Coal-Dust Explosions," by G. S. Rice, and "The Appraisal of Coal Lands for Taxation," by H. M. Chance.

Thursday evening there will be an informal reception preceding an illustrated lecture on "Ancient Methods of Iron Manufacture in China," by T. T. Read. This will be followed by moving pictures of safety methods in mining, provided by the U. S. Bureau of Mines.

On Friday, at 9:30 a.m., the following papers on coal and coke will be read: "Coal-Dust Explosion Investigations," by J. Taffanel; "Coal-Mine Explosions Caused by Gas or Dust," by H. N. Eavenson; "The Pittsburgh Coal Field in Western Pennsylvania," by H. A. Kuhn; "The Book Cliffs Coal Fields, Utah," by R. S. Lewis; "An Aërial Tramway for Mining Cliff Coal," by A. E. Gibson; "Tin and Coal Deposits of the Fu Chuan District, China," by M. B. Yung; "The Manufacture of Coke," by J. P. K. Miller.

On Friday afternoon excursions will be made to the Homestead Steel Works of the Carnegie Steel Co., or Mc-

sey and W. F. Schwedes; "Gasoline Locomotives in Relation to the Health of Miners," by O. P. Hood; "Shot-Firing in Coal Mines by Electric Circuit from the Surface," by G. S. Rice and H. H. Clark. There will also be a general discussion on the use of electricity in mines, under the direction of the Committee on the Use of Electricity in Mines.

Electrifying the Anthracite Mines

The substitution of electricity for the direct use of both steam and compressed air in the anthracite mines of Pennsylvania is foreseen as a possibility in a paper read before the Engineers' Society of Northeastern Pennsylvania. The data for this "Historical Review of the Use of Electricity in the Mining and Preparation of Anthracite Coal in the State of Pennsylvania" was gathered this summer by a committee of electrical engineers, of which H. M. Warren, of the Delaware, Lackawanna & Western R.R. Co., was chairman.

In the summary of apparatus in service, the authors stated that the grand total of electric generating capacity and power purchased for use at the mines is given as 79,811 kw., which is approximately equal to 105,400 hp. The horsepower produced by steam at the mines is given as 531,289 in the last annual report of the Bureau of Mines of Pennsylvania. As 91,010 of this is used for electricity, this leaves 440,279 hp. produced by steam for direct use. Thus almost a fourth as many horsepower are transmitted electrically at the mines as are produced by steam for direct use.

The introduction of electricity in any great quantity into the mines is not more than two decades old. The first electrical installation was made in 1887 by the Pennsylvania company. In 1889 the Thomson-Houston Co. installed a locomotive and a generating station in the Erie colliery of the Hillside Coal & Iron Co. It is interesting to note that this locomotive was in service until 1911, or for a period of 22 years of continuous operation. The first electric pump installed was in 1890, and it has been in continuous operation ever since. From 1891 to the present year plant after plant has been installed in the mines and a gradual evolution has taken place.

Today there are 169 miles of wooden pole lines above ground and 754 miles of trolley wire below ground in the anthracite mines. There are 951 electric locomotives using an estimated amount of over 60,000 hp. The other electrically operated equipment consumes 19,170 hp. for breakers and miscellaneous machinery, 23,280 hp. for electric hoists, 38,500 hp. for electrically driven pumps, 2920 hp. for coal-cutting machines, 3650 for lighting and about 100 hp. for heating. There are now five breakers equipped with individual motor drives, and others are under course of construction.

An Improved Sighting Compass

There has recently been placed on the market by the Davis Instrument Manufacturing Company, Inc., Baltimore, Md., a simple improved sighting compass designed particularly for mining work.

As shown in the accompanying figure, this compass has both a vertical and a horizontal limb. The vertical circle reads to half-degrees, while the horizontal limb is graduated to read single minutes, by the assistance of a vernier. The instrument with its tripod weighs only 8 lb. As shown in the figure, the instrument is supplied with leveling screws and a shifting head that enables it to be quickly set up and adjusted for the giving of sights.



DAVIS SIGHTING COMPASS
FOR MINING WORK

The distinct advantage possessed by this instrument over the usual form of sighting compass is the sighting tube, which has the appearance of a telescope although containing no lenses. The tube is equipped with adjustable crosshairs that insure accuracy in sighting.

Another important improvement is the provision made for sighting in a vertical plane, which enables the instrument to be used on steep pitches, with great accuracy. While this compass is designed for the use of mine superintendents and foremen in extending the sights given by

the engineer or surveyor, it is also a convenient leveling instrument for the use of builders. When desired, an extra spirit level is mounted on the sighting tube, for the purpose of giving level sights, although this addition is unnecessary in the use of the vertical circle.

Illinois near the Head in Mineral Production

Illinois was third among the states of the Union in 1913 in the value of its mineral production, according to figures of the United States Geological Survey, compiled in coöperation with the Illinois State Survey. The state owes its prominence as a mining state chiefly to its importance as a producer of coal and petroleum and to the development of its clay-working industries.

In coal production Illinois is exceeded only by Pennsylvania and West Virginia, and in the production of petroleum only by California and Oklahoma. In the manufacture of clay products Illinois ranks fourth.

The value of the mineral production of Illinois in 1913 was \$131,825,221, of which the coal mines contributed \$70,313,605, or 53 per cent.; the petroleum wells \$30,971,910, or 23 per cent.; and the brickyards, tile works, and potteries, \$15,195,874, or 12 per cent.

In 1912, the value of the total mineral production was \$123,068,867, including \$70,294,338 for coal, \$24,332,605 for petroleum and \$15,210,990 for clay products. The total increase of \$8,756,354 in 1913 over 1912 was therefore principally in oil production.

These figures do not take into account the manufacture of pig iron nor the manufacture of coke, the raw materials for which are imported from the Lake Superior region and West Virginia, respectively. In the manufacture of pig iron Illinois stands third, being exceeded by Pennsylvania and Ohio. If the value of these products in 1913 were added, the total value of the mineral products of the state would be increased by nearly \$55,000,000.

Another important mineral industry of Illinois is the manufacture of portland cement, this product in 1913 having the value of \$1,784,696, an increase of \$1,340,611 over the previous year.

The quantity of natural gas produced in Illinois when compared with the output of the other fuels is insignificant; nevertheless in 1913 the value of this fuel was \$574,015. Coal, petroleum and natural gas had a combined value in 1913 of \$101,859,530, an increase of more than \$6,500,000 over 1912.

Coal Mining in Alsace-Lorraine

The Alsace-Lorraine district, which has been the scene of more or less important battles in the European war, is quite an important coal producer. The output in 1913 aggregated 3,795,932 tons as compared with 3,538,722 tons in 1912. The coke production experienced a slight decline from 94,595 tons in 1912 and 91,745 tons in 1913.

About half of the entire production is consumed locally, and by far the larger part of the remainder is shipped to south Germany and the Rhine Provinces. Other consumers are Switzerland, France, Luxemburg, Austria and Italy.

Recent Developments in Byproduct Coke Practice

BY WILLIAM BLAUVELT*

SYNOPSIS—Some notes on recent improvements in byproduct-oven construction, with particular reference to the Semet-Solvay process. Some figures on the enormous losses resulting from the use of beehive ovens are given. Comments and suggestions as to methods of coking are also included.

In 1913 the tonnage of byproduct coke amounted to 12,714,700 tons, or more than 27 per cent. of the total coke produced in the country. This is an increase of about 1,600,000 tons over 1912, and it is probably not far from the truth to say that by the close of the current year the production will be at the rate of 14,000,000 tons per year. Compared with 1910, this means a growth of 100 per cent. in four years.

From the U. S. Geological Survey reports it appears that the average value of the coke and byproducts obtained per byproduct oven in 1912 was \$11,265, as compared with \$1019 as the average yield per beehive oven. The total value of the byproducts recovered was over \$16,000,000. If these had been recovered from the coal used in making coke in beehive ovens, they would have been worth approximately \$80,000,000—at the prices ruling in that year. The average yield of coke from byproduct ovens was 75.3 per cent. and in beehive ovens 64.7 per cent., a difference in favor of retort ovens of 10.6 points, or 16.4 per cent. If this yield had been obtained from the beehive ovens, it would have added to the wealth of the country 5,390,000 tons of coke, if the same coals had been coked in byproduct ovens, in addition to the above value of the byproducts. This loss is equivalent to the absolute destruction of about 6,800,000 tons of our coal supply during the year.

I have given these figures as suggestive of the importance of the byproduct oven in the conservation of natural resources. In this connection it is interesting to note that recent work in some byproduct ovens is showing conclusively that the high-volatile coals of the Connellsville and Klondyke districts make byproduct coke quite equal to the best coke that can be made in beehive ovens from the same coals.

The map, Fig. 1, shows the distribution of the byproduct coke plants in the United States. There are 42 of these plants. The map shows that in almost every case the byproduct ovens are located at the point of consumption rather than at the coal mines, as distinguished from the almost universal practice with regard to beehive plants. In the five coke-producing states of the South, the percentage of byproduct coke is much larger than in the country as a whole. With the completion of present construction nearly half of the coke made in the South will be byproduct coke. This point is worthy of consideration in connection with the work the Southern states are doing in the conservation of their resources.

One of the most notable improvements which has been made in the industry since its introduction into this

country is the increase in output per oven unit and per man employed. When the first ovens were brought over from Europe they had a capacity of 4.4 tons of coal per day, and one crew of men was capable of handling about 25 ovens. This gave a capacity of 110 tons of coal per day with a unit crew.

Today the most modern ovens have a capacity of 20 tons of coal per day, and improved organization and modern machinery permit practically the same crew to handle from 50 to 60 of these ovens, thereby coking from 1000



FIG. 1. MAP SHOWING LOCATION OF BYPRODUCT OVENS IN THE UNITED STATES

to 1200 tons, instead of the original 110 tons. I know of none of the other metallurgical industries which has shown a larger growth in tonnage efficiency in the same time. This is a conservation of labor well worth considering along with the conservation of our coal supply. Progress in this respect has been distinctly greater in America than in Europe.

WASTE-HEAT OVENS

The byproduct oven has been developed along two lines, the waste-heat oven, and the oven recovering the maximum amount of surplus gas. The former is the simpler type. It is ordinarily installed in places where the gas has little value. As is well known, in the carbonization of coal in a retort oven a portion of the gas produced is used for heating the ovens while the remainder is available for other uses. The waste-heat oven is not designed to obtain the greatest possible quantity of surplus gas and the products of combustion going off at a

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Note—Paper presented at the sixth general meeting of the Iron and Steel Institute, New York, May 22

high temperature are utilized for raising steam. This practice is comparable with that employed in those beehive-oven plants where the tunnel-head gases are collected and led under boilers, and to the non-regenerative heating furnace with boilers for utilizing the waste heat.

With the growing use of machinery for the storage and preparation of coal and for the preparation of coke, and the substitution of machinery for hand labor in other parts of the process, the requirements for power have grown materially, so that the amount required for a modern coke-oven plant is very considerable. There are many cases where the most economic results are obtained by a plant, so designed that there is just enough heat in the waste gases to supply the steam required, leaving the remainder of the gas available for sale.

A boiler plant properly designed for waste heat, with its accompanying economizers for preheating the feed water, is the most economical apparatus for utilizing heat in an industrial plant; that is, such a boiler plant will deliver the gases to the chimney, or to the exhaust fan which often replaces the chimney, at the lowest possible

smallest amount of fuel, and at the same time maintain, as far as possible, simplicity of construction and operation. In this design, regenerators are substituted for the recuperative system, one pair of regenerators for each oven, with the two chimney flues arranged between them. The whole construction of the oven and regenerator is located between the two vertical walls peculiar to this type of oven. These walls extend from the concrete foundation straight through to the top of the oven.

The operation of the regenerators is, in general, similar to that of an openhearth furnace, except that an entire block of 60 or more ovens is reversed at one operation. The air is usually blown in by a fan located beyond the reversing damper and is distributed under the block through a single chimney flue. It enters at the bottom of the regenerator, rises and passes through the flue system, meeting the gas at the several burners in the combustion flues. On reversal, the air enters the other regenerator, rises through the air flue, shown in dotted lines, and descends through the horizontal combustion flues, meeting the gas as before. The products of combustion pass out through the other regenerator to the reversing damper and stack in the usual manner. By this system the entire series of combustion flues are swept by all of the air required for combustion, so that hot spots are prevented and a uniform temperature is maintained throughout.

PROBLEMS IN OVEN CONSTRUCTION

Anyone familiar with the use of the high temperatures required in metallurgical work will realize the difficulties connected with the proper heating of a byproduct oven. The walls of the chamber are, say 36 ft. long and about 12 ft. high. Every portion of both of these chamber walls must be heated to a high temperature, and the temperature must be uniform in all parts, excepting that perhaps the upper part may be somewhat cooler. Any inability to control the temperature at any portion of this surface, about 430 sq.ft., means the production of imperfect coke, delay in the operation, or injury to the brickwork.

The method used in controlling the heat over this surface is interesting. It is illustrated in Fig. 4. The air raised by the regenerators to a temperature of about 1000 to 1100 deg. C. travels through the flue system, as described above. At the ends of the flues are gas burners, consisting of simple pipes, which admit the gas. When the air is traveling downward through the system it flows through the first flue until it reaches the first gas burner. The stream of gas is deflected downward by the air current and burns in the air as it travels through the flue. At the end of the second flue the air meets another stream of gas, which also is deflected downward and heats the third flue, and so on, until the gas from the last burner consumes the last of the oxygen.

When the air current is traveling upward the streams of gas are deflected upward, so that the entire combustion system is reversed at the usual half-hour periods by the manipulation of only one reversing damper for the entire block of ovens. A proper adjustment of the relative amount of gas delivered by each of the burner pipes maintains just the right relation between the heats in the different parts of the system, with the minimum attention. This method insures an even distribution of heat throughout the whole heating system. It seems clear also

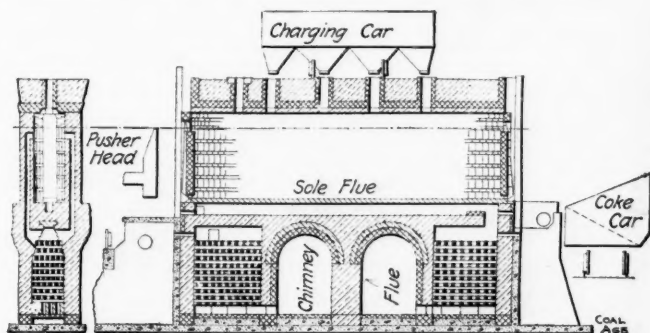


FIG. 2. SECTIONAL VIEW OF A TYPICAL OVEN

temperature consistent with commercial results. Such a design permits a very simple type of oven, with low first cost of operation. In the type of oven with which I am most familiar, the Semet-Solvay oven, these principles have been thoroughly developed, and under the conditions described above very satisfactory results have been obtained. A typical cross-section of this oven is shown in Fig. 2.

The gases are burned in the combustion flues, and then passed to the sole flue beneath the oven and out through the chimney flue to the boiler plant. The air for combustion passes first under the sole flue and then through the narrow flues on each side, where it comes into intimate contact with the heated brickwork; thence upward to the heating flues, where it meets the gas.

By a proper proportioning of these parts enough heat is abstracted by the air from the waste gases, so that the highest temperatures may be produced in the combustion flues, and at the same time sufficient heat remains in the waste gases to produce all the steam required for the operation of the plant, without any expense for fuel or for labor in firing. This system requires no attention from the operators except the regulation of the air at the burners on the one hand, and the maintenance of proper water supply to the boilers on the other. This method of heating the air is called "recuperation," to distinguish it from the familiar form of regenerator common to most high-temperature furnaces.

Fig. 3 shows an oven designed to operate with the

that in the practice of passing the entire volume of air required for the combustion through the entire flue system there is a gain in efficiency of transfer of heat from the hot gases to the oven walls, as compared with the older methods of heating.

There has been some discussion as to whether the heating of a byproduct oven is effected by radiant heat or by convection and conduction, but I believe that the arguments are in favor of the latter theory. Under the conditions which exist in a coke oven the brick wall, at working temperatures, is a good conductor of heat.

This is illustrated by the fact that an increase of the thickness of this wall from $2\frac{1}{2}$ to $4\frac{1}{2}$ in. does not demand in practice a higher temperature in the flues to produce the same result in the coking chamber. The flame as burned in the oven flues is only slightly luminous, and it has been shown by good authority that the radiation from a non-luminous flame is only about one-third of that from a luminous flame. Moreover, radiant heat is transferred in accordance with the difference between the fourth powers of the temperatures of the radiant and receiving bodies, while heat is transferred by conduction proportionately to the first power of the difference in temperatures. It would therefore seem clear that under the conditions we are considering, at least a large portion

supply and to the inspection of the heating flues in a block of byproduct ovens cannot be stated too strongly. With a given coal, the quality of the coke produced depends very much upon the maintenance of the proper temperature in the oven, not only as a whole, but in every part; nothing injures the quality of the coke more than inequalities in the heat in different parts of the chamber, so that certain portions of the charge are over-coked while the cooler spots are being finished. In an industrial plant it is essential that any important operation shall be done conveniently and in comfort to the operator, otherwise one may be sure that it will be done badly except under the closest supervision. Given good construction and simplicity of parts, the oven which permits the most convenient and accurate control of the heats is the best.

DISCUSSION BY CARL A. MEISSNER

The figures given in Mr. Blauvelt's interesting paper show in a striking manner to how great an extent our national coal resources, and the valuable byproducts derived therefrom, could be conserved by the more extensive use of the byproduct as against the beehive oven. He also describes the development made by his company in the construction of byproduct coke ovens in increasing their capacity and efficiency.

Mr. Blauvelt shows clearly how much has still to be done in this country in order to replace the beehive ovens by the byproduct ovens. The main reason for this is claimed to be the high initial cost of constructing a byproduct-oven plant as against a beehive-oven plant. I say "claimed to be," because when we consider all the costs—the conservation of the coal, larger coke yields, the recovery of the gas, tar, sulphate of ammonia, benzol, etc., in fact, all factors connected with the question of manufacturing coke from coal—it is not possible to present any figures that will not show a much larger return on the original investment from a byproduct coke-oven installation as against a beehive. This is the ultimate crux of the whole situation from a manufacturer's standpoint.

The advantages of better coking control, more uniform quality of coke, ability to collect and mix at one plant various coals, to improve blast-furnace operations, lessen the coke consumption and reduce the whole cost of making pig iron, as well as improve its quality for making steel, are all points that have to be taken into consideration.

Mr. Blauvelt refers to the gradual increase in capacity of ovens, which is governed largely by their dimensions and by the coking time. I am satisfied that we will be able to increase this capacity slightly with every new plant that we may build until the final limits, which will be governed by practice and experience, are reached. Great care must be exercised in doing this. I know of several cases where attempts were made to "jump" to greater dimensions with very unsatisfactory results.

As to the number of ovens to a battery and the number of batteries to a plant, this is again a matter for careful study and consideration. We have at Gary, Ind., 560 ovens and at Joliet, Ill., 280 ovens, and our experience has been that the operating cost per ton of coke at these two plants is practically the same. We feel that it would not be wise to place more than up to 100 ovens of American silica-brick construction in a battery nor install more than 600 ovens in a plant unit. The operative supervi-

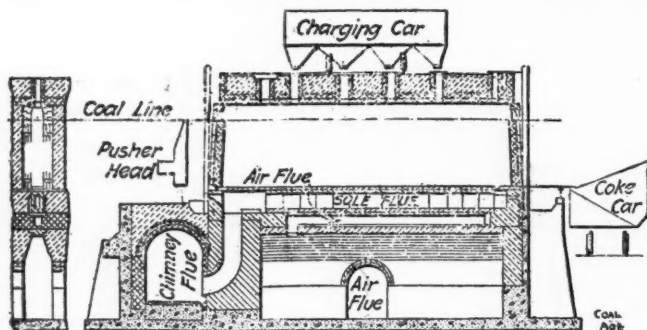


FIG. 3. LONGITUDINAL AND END ELEVATIONS IN SECTION

of the heat transferred from the hot gases to the flue walls must be by convection and conduction, and the system which uses this latter method is the more efficient.

In a system of heating flues where the layers of gases lying next to the walls are practically stationary, or moving slowly, it has been shown by experiment that these layers of quiet gases form an effective nonconductor which offers a greater obstacle to the transfer of heat than the wall itself. When the flow of gases is sufficiently rapid to sweep away these quiet layers, the hot gases are permitted to come in direct contact with the walls and transfer their heat to the substance of the wall according to the first power of the difference in temperatures, and the efficiency of transfer is proportionately good. The comparative rapidity of flow of the gases during their combustion also has the practical value of distributing the heat and preventing injury to the brickwork, avoiding thereby the dangerous condition which arises in an operation where temperatures are generated approaching the melting point of the refractory material.

Each burner on the Semet-Solvay oven is directly under the hand of the man in charge of the heats as he walks in front of the ovens, and each flue may be inspected by the removal of a plug from a peep-hole. The importance of convenient access both to the control of the gas

sion becomes more difficult unless additional department heads are employed, which means increased cost, and where coke has to be "made right" in order to give the best results in a blast furnace, this operative supervision is a factor of prime importance.

COKING HIGH-VOLATILE COALS

The most important question that has probably delayed more serious consideration of byproduct coke-oven installations and prevented greater progress in this direction, has been whether high-volatile coals can be coked in byproduct ovens so as to give as good a blast-furnace coke as many of them do in beehive ovens. This refers particularly to the great Connellsville and Klondike coal regions, though it also affects many other districts having high-volatile coals heretofore not considered fit for coking even in beehive ovens. Mr. Blauvelt refers to his successful experience with the use of high-volatile coals and all of our experience in this direction shows that many of these can be coked to the extent of 100 per cent., so as to give a good blast-furnace coke, while in other cases suitable coke is made by the admixture of 10 to 35 per cent. of low-volatile coals. Even those coals which have been considered by many as not being at present available for coking purposes—such as certain sections of the Pittsburgh seam, and those of a great many other coal districts—have been and are being used to make a satisfactory blast-furnace coke by being mixed with larger quantities of low-volatile coal, up to 60 and 80 per cent. of the latter being used.

There can be no further question in my mind that the present types of byproduct coke ovens have solved the problem of ultimately being able to utilize for coking purposes in a greater or less degree almost any bituminous coal found in this country. Even anthracite coals are mixed in small proportions with some of the high-volatile coals in Germany and have been found to make a more satisfactory coke than some of these high-volatile coals when coked at 100 per cent.

In view of all the above, the point of keen interest is the type or system of byproduct oven which is best suited for accomplishing this. Mr. Blauvelt very clearly points out what the requirements of the horizontal type of oven are for this purpose, and he shows that simplicity and perfection of uniform heating are the two main requisites.

The new Semet-Solvay horizontal-flue regenerative oven described by him is one of the latest types of byproduct oven constructed to meet the conditions in this country. It naturally differs materially from the latest type of vertical-flue oven now in successful operation in the United States. The oven described by Mr. Blauvelt represents the successive and progressive steps made by the Semet-Solvay Co. in strength, simplicity and effort for uniform temperature.

OVEN TYPES AND COKING TIME

Much has been said in favor of simplicity of recuperation as against regeneration for the combustion of the gas in the flues, also of continuous heating versus reversing; but, all told, all modern types have finally found it to be more economical and efficient to use regeneration in place of recuperation, except in certain isolated cases, as pointed out by Mr. Blauvelt. Unless great care is taken in design, it is almost impossible to prevent short-circuiting or leakage of gas and air in recuperative cham-

bers or flues and this is not only wasteful, but impairs, to a certain extent, the efficiency and the control of combustion.

The strength of construction in this latest type of Semet-Solvay oven is a noteworthy feature of great importance, for strength of oven and flue walls is imperative in our modern coke-oven practice of fast driving necessitated by short coking time. The simplicity of control of gas and air and the ready supervision of the combustion in the flues by means of peep-holes are factors that will appeal to all coke-oven operators.

As to coking time, I regret we have no definite data from Mr. Blauvelt, for this is a point of great importance to us. We have found, as a rule, that the shorter coking time gives the best blast-furnace coke and that there must

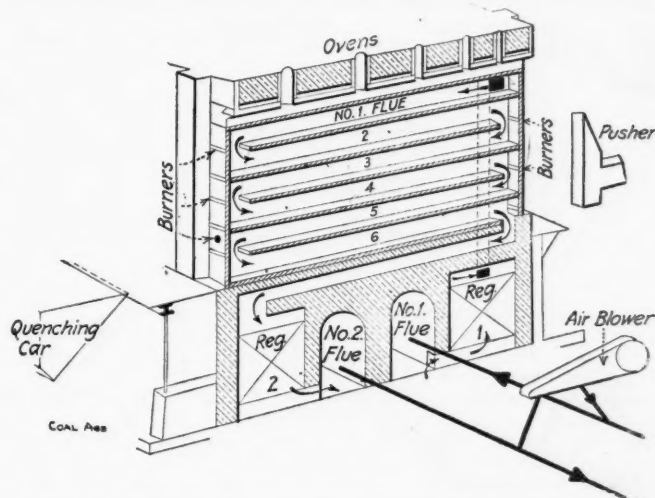


FIG. 4. THE ARRANGEMENTS OF THE SEMET-SOLVAY OVEN

be no delay in pushing the coke out of the oven after it is coked. What the actual length of coking time for various coals alone or in mixture is, has to be determined by actual trial; so far, we find that there is no great difference in coking time in the type of oven with which I am most familiar, whether we use high- or low-volatile coals. It may be found advisable to increase the coking time somewhat when using all high-volatile coals, but the difference between this and low-volatile mixtures does not, in our present experience, exceed, say, two hours on the average.

In view of its ability to obtain high and uniform coking temperatures, I can see no reason why the new Semet-Solvay coke oven should not be able to make coke in practically the same time as that of any other system. All in all, this latest development is of keen interest to us, as it is the purpose of the company with which I am connected, the United States Steel Corporation, to adopt always the latest and most approved type of byproduct coke oven, being in no sense whatever tied down to any one system by preference, prejudice or any other reason.

Some English coal figures were supplied to the Nottingham Society of Engineers by W. Bardill. Whereas the coal output in 1860 was 80 million tons per annum, in 1911 it was 270 million tons. Forty years ago, an output at a colliery of 500 tons a day was regarded as heavy indeed, but today, at many collieries, they raise 3500 tons per diem. This marvelous development was attributed to the increased use and adaptation of mechanical appliances by mining engineers.

The Labor Situation

SYNOPSIS—The Ohio situation is a deadlock, because the miners have bound themselves to make a contract with the eastern Ohio operators which would be wholly unfair to their employers. But some of the miners are disposed to withdraw concessions already offered, returning to their former demand for 49.64c. per ton of machine-mined, run-of-mine coal. In Colorado, President Wilson has suggested a form of agreement which seems more acceptable to the miners than to the operators.

Since the adjournment of the joint-scale committee in eastern Ohio on Sept. 4, there has been no reason to suspect that an agreement will come soon. In fact, the position of the miners has been considerably strengthened by the approaching solution of the difficulties in Colorado, and by the rehabilitation of union funds, now that the Vancouver and West Virginia troubles are ended. The expectation that all the resources of the union will now be diverted into eastern Ohio fills the miners on strike with the keenest of satisfaction. It is as if Germany and Austria were to make peace with all nations but France. Such a consummation would fill Germany with assurance and France with gloom. The position of the eastern Ohio operators is not less harassing than would be the position of the French republic under such circumstances.

A Fair Proposition

The operators have offered a new compromise on the run-of-mine law. They have offered to pay for slack, but not at the lump-coal price. They will give 58c. for lump coal and 22c. for slack, and it must be conceded that the offer is equitable and shows that the operators are now prepared to accept an exact equivalent, provided that their interests are protected by a scale which will reward the miners for care in handling their coal.

The proportion of coal which is not slack is 64 per cent. The equivalent rate to that formerly obtaining, namely, 69½c., should be $64 \times 69\frac{1}{2}$, or 44.48c. But if 64 per cent., the lump coal proportion, is paid for at a rate of 58c., 37.12c. per ton mined will be realized for the lump coal. If 36 per cent., the slack portion, is paid for at 22c. per ton, then 7.92c. per ton mined will be realized for the fine coal. Adding these together, we find that the miner will receive 45.04c. per ton, which is 0.56c. per ton more than an exact equivalent.

How any right-thinking man can turn down such an agreement is beyond comprehension. It is surely right to put a premium on the making of large coal, and to pay the miner for both kinds of fuel approximately on the basis of selling prices. By refusing this most reasonable offer, the miners of eastern Ohio have placed themselves in an unenviable position. Their only defense now is that they have made a promise to the operators in other parts of Ohio which they cannot break. Such a promise, which meant a reduction in wage in southern Ohio and an increase in eastern Ohio, should not have been made. Surely the miners in eastern Ohio should be allowed by the union to return to work at an increased wage, regardless of how small that increase may be. For everywhere else they have been counseled to return to work at unchanged wages except in the rest of Ohio, where wages are actually decreased.

Disposition to Return to Work

The men are really disposed to return to work in most cases at the offers made to them by the operators. The miners at the Pursglove mine at St. Clairsville are said to have held a meeting on the 9th and decided that they were willing to return on the 58-22 basis. But several out-of-town officers of the organization came around in the nick of time and prevented the men from acting. At Neff, where there has been much destitution, the prospect of winning the strike by a half-cent rise and a recognition of the run-of-mine bill looks too good to the men to be passed up. It is stated that 270 men out of 300 on a local comprising the miners of the United States Coal Co., in Bradley, petitioned their representatives at the miners' and operators' conference to settle the strike on the best terms available. The petition was not read.

But Some Men Get Less Reasonable as Time Passes

But the sentiment is not all in one direction. On the 10th, 225 members of Local No. 1077 held a mass meeting and

unanimously adopted a resolution calling, not for 47c., but for the original demand of 49.64c. for machine-mined run-of-mine coal. The local is composed of employees of the Rail & River mine in South Bellaire, and there are about 400 members in all. Local union No. 1666, of the Fort Pitt mine, opposite Moundsville, W. Va., discussed the same matter and urged that the demand for 49.64c. be renewed.

The Militia Wanted by the Miners

Another difficulty has arisen. The operators formerly employed union men to operate their pumps and fans. Recently they have called on their petty bosses to do that work. These men are nonunion employees, and the miners insist that the understanding with J. M. Roan, the mine commissioner, to the effect that only union men should be employed, be carried out. It is not clear whether these bosses, who are replacing the union pumpmen, engineers and repairmen, are monthly employees who are usually paid by the company whether the mines work or not. Some of the companies have let the mines be flooded and the air become stagnant rather than engage union men who are striking against them.

Local union No. 430, at McClainsville, west of Bellaire, passed a resolution requesting that troops be sent to Belmont County to compel the operators to reinstate the men thrown out of work by the employment of petty bosses. They have urged that the need for this work is just as urgent now as it was when the operators desired the militia for the protection of those nonunion men who were then doing the pumping and repairing.

There has been some expectation that the operators would introduce strike-breakers, but W. R. Woodford, president of the Pittsburgh Vein Operators' Association of Ohio, denies it without qualification. Benefits of \$3 weekly will be paid from now on by the union, and now union activity elsewhere has ceased, a large amount of money will become available to back the eastern Ohio cause. This feature, and the miners' pledge for a 47c. rate, will be the sole causes for delayed settlement.

The operator is not unreasonable in eastern Ohio. He surely has outstripped all other operators by offering an increase in wage, however small. Even 44.61c. on a mine-run basis has been offered, and this is better for the miner than last year's scale.

The Coshocton Difficulties

In the Coshocton district, the scale has not yet been adjusted, but arrangements have been made for a conference in the near future to try to arrive at an adjustment. The difficulty in that district is not so much a matter of scale as the question of the payment of 5c. a ton to the men for pushing the mine cars from the neck of the room to the face and back again when loaded. It is believed the matter will be amicably adjusted.

Questions of the quantity of fine coal allowable under the mine-run law have generally been settled at the various mines without calling on the Ohio Industrial Commission.

Violence at Elverton

At Elverton, Fayette Co., W. Va., there has been a strike resulting in much violence. On the 10th of this month, several men were being lowered down a plane. Two loads of men were allowed to pass, but riflemen, declared to be strikers, fired at the men in the third car and killed one man who had lately arrived from Pittsburgh, Penn.

The shooting began at 4.30 p.m. and continued for 15 min. After the men had reached safety in shanties at the foot of the hill, the fire was directed on the company store, which also serves as the home of W. R. J. Zimmerman, the manager of the Branch Coal & Coke Co. The shooting was maintained at intervals till 5 o'clock, and fire was returned from the company store and office.

The dispute is about a check weighman whom the company refuses to recognize. The man is declared to be neither in the employ of the company nor a practical miner. The miners' officials and Gov. Hatfield, president of the board of conciliation, have tried to get the men back to work, leaving the dispute open till the governor has had time to render his decision. The men will not accede to this arrangement, though it follows the lines of their agreement. The company declares it will not reinstate four of the striking men. It has employed its own detectives and has refused to accept the assistance of the sheriff's officers. It is thought that much trouble may result, and the subdistrict president, L. C. Rodgers, of the New River United Mine Workers, declares he is

endeavoring to prevent union men from compromising themselves by staying around the scene of the trouble.

No Reduction in Wage

From all quarters, we are assured that there is no truth in the story that there has been a decrease in the mining rate along the Norfolk & Western Ry. William Leckie, a large operator of Welch, W. Va., writes us that he has not heard of any such reduction in rate. N. H. Mannakee, civil and mining engineer, of Williamson, W. Va., also declares there has been no cut in that region. It has also been reported to us that inquiries have been made throughout the Pocahontas field, and no operation has been discovered at which any cut had been made.

The Mailed Fist

Some time ago we printed an editorial entitled "The Mailed Fist," condemning certain orders of the War Department, and learned later, apparently in contradiction of our statement, that the administration did not require men to be citizens of the state of Colorado before entering the service of Colorado coal corporations. Residence alone, we learned from the War Department, was required. We expect to publish a full record of the War Office orders which we have secured, and to add to it the letter of the War Office to us, in which the issue is carefully dodged. An order was issued on Aug. 14, 1914, requiring that all miners recently employed must be citizens of the state of Colorado. Afterward, this order was modified, and it is no longer in force.

The Colorado Armistice

President Wilson is endeavoring to arrange a three-year agreement between the Colorado operators and union miners. The latter have spent \$3,000,000 on their strike, and are at their wits' end to secure the money for further finance, especially since the eastern Ohio situation has called for money in larger quantities in the hitherto peaceful states. The agreement, on which we expect to comment next week, is as follows:

There hereby is established a three-year truce, subject to:

1. The enforcement of the mining and labor laws of the state.

2. That all striking miners, who have not been found guilty of violation of the law, shall be given employment by the employer they formerly worked for, and where the place of the employee has been filled, he shall be given employment as a miner at the same or other mines of the company.

3. Intimidation of union or nonunion men strictly prohibited.

4. Current scale of wages, rules and regulations for each mine to be printed and posted.

5. Each mine to have a grievance committee to be selected by majority ballot at a meeting called for the purpose, in which all employees (except officials of the company) have the right to participate.

Members of said committee must be employed at least six months at the individual mine before being eligible.

Married men to be in the majority on each committee.

6. It is understood as a condition of the creation of said commission that during the life of the truce,

- (a) The claim for contractual relations is to be waived, but this shall not prevent the voluntary agreement between any employer and their employees during the life of this truce.

- (b) No mine guards to be employed, but this does not preclude the employment of necessary watchmen.

- (c) In the establishment of the truce, the presence of the federal or state troops should become unnecessary.

- (d) There shall be no picketing, parading, colonizing or mass campaigning by representatives of any labor organization of miners that are parties to this truce, which will interfere with the working operations of any mine during the said period of three years.

- (e) During said truce, the decisions of the commission in cases submitted shall be final and binding on employers and employees.

- (f) There shall be no suspension of work pending the investigation and reaching a decision on any dispute.

- (g) The suspension of a mine over six consecutive days by the company may be authorized for cause satisfactory to the commission, but not pending any dispute.

- (h) Wilful violators on any of these conditions will be subject to such penalties as may be imposed by the commission.

The Miners Approve and Operators Question

The miners' convention on Sept. 16 voted to accept the proposals after a two-day debate, the vote being 83 in favor of the agreement and 8 against it. The Colorado mine operators held a meeting Sept. 19 and succeeding days, to prepare a reply to the President relative to the proposed agreement. A committee was formed to formulate a reply, consisting of J. C. Osgood, F. E. Gove, of the Victor-American Fuel Co., and D. W. Brown, of the Rocky Mountain Fuel Co.

The Colorado Fuel & Iron Co., through J. W. Welborn, its president, declares that it does not have room in its mines for all strikers not proved to be criminals. It has already almost as many men as it needs in the service. Mr. Welborn also declares that it is dangerous to employ men hostile to the company's purposes, at work as hazardous as coal mining. He states that, where there are vacancies he is willing

to employ any strikers who have not been guilty of acts of violence or overt hostility.

He objects to the provision giving a commission the right to determine whether the company shall close its mines for more than six days at a time. He states that the needs of the market are best known to the company. He also declares that the assessment of fines would only be operative against the coal corporations, as the men could not be made to pay them. He is very willing to see that the mining laws are complied with, and says that they have always been observed by his company. He also adds that, in accordance with the proposal, he has already ordered a full publication of the rates of mining and regulations appertaining thereto.

At Last an Agreement Is Made in the Southwest

Districts 14, 21 and 25, comprising Kansas, Missouri, Arkansas and Oklahoma, held conventions in Kansas City, at which the joint interstate agreement was ratified with minor changes, and the agreements reached between the committees of operators and miners were also ratified with trifling modifications. The new contracts, which remain in force till July 31, 1916, make practically no change in the wage scales. The chief changes are in local matters affecting only the particular districts.

The most important matter of the present contract and interstate agreement is that as to arbitrators. All disputes reach finally, under the new plan, a board of arbitration or district joint board, which is supposed to settle grievances without strikes or stoppage of work. This board consists of three members from the miners and three from the operators. There is to be a joint board in each district, but there will be two such boards in District 21, one for Arkansas and one for Oklahoma.

The officials of the districts and of the conference are this week going over the agreements and conferences carefully preparatory to their formal publication.

The boards appointed are as follows:

Kansas, District 14—Operators: George Richardson, commissioner; Ira Clemens, John Mayer. Miners: Bernard Harrogon, district president; Francis McDonald, James James.

Oklahoma, District 21—Operators: E. W. Hogan, commissioner; Dan McAlpine, James Cameron. Miners: Edward Cunningham, district president; Pete Hanraty, Ben Brown.

Arkansas, District 21—Operators: E. W. Hogan, commissioner; William McKinley, M. M. McWilliams. Miners: Edward Cunningham, district president; Peter Stewart, Robert Kendrick.

Missouri, District 25—Operators: W. L. A. Johnson, commissioner; William Harkes, B. T. Whitey. Miners: George Manuel, district president; B. C. Morrow, Charles Daither.

The Bache-Denman Coal Co. Approves the Check-Off

It is interesting to see that the Bache-Denman Co. is now using the check-off as a weapon to collect money from the Arkansas union for the riot and arson of the members of that organization at the Bache-Denman mines. Judge Frank A. Youmans has attached the funds of the Union in a dozen banks of western Arkansas at the suit of the Bache-Denman Coal Co., and the miners are not desirous of collecting the check-off if the money thus collected is to be lost to them by being applied to pay for the losses due to their lawlessness. It will take a long time for the Arkansas union to collect \$1,250,000, and the men threaten to strike on general principles. Evidently such a strike can only be called for the purpose of influencing the court against continuing to attach the money of the union.

Our Front Cover This Week

The interesting photos shown on the front cover of COAL AGE, this issue, were furnished us by the General Electric Co. The two locomotives shown in the pictures are of "G. E." manufacture, the one operating in Kentucky being a 5-ton machine. Locomotives of this type are now being used for long hauls on the surface, as well as underground.

Mine Foreman Association Meet

In our issue of Sept. 5 we stated that the Knoxville field day was to be held on Oct. 15. This should have read Oct. 24. A number of teams are to compete for some nice prizes. The event is under the auspices of the Mine Foreman Association.

The Export Trade

A British View of Our Possibilities in the South American Trade

The *Colliery Guardian* (London, England) has the following to say regarding our attempt to break into the South American coal markets:

If this country is in a position to detach a large portion of Germany's foreign trade at the present time, it should not be forgotten that the United States, free from most of the difficulties that beset us, cherishes hopes also of benefiting from the embroilment of Europe. Amongst other ambitions, the desire to popularize Pennsylvania and West Virginia coal in South America is prominent. It is highly probable that efforts will be made to introduce American coal in other markets, but the Argentine Republic and Brazil naturally present themselves as those which, *a fortiori*, are most vulnerable to attack.

The matter, however, is not so simple as it looks. In the first place there is the difficulty that the United States has few ships adapted for this trade. The Ship Registry Bill, which has just passed through the American Senate, seeks to provide a remedy. The Bill admits to registry in the United States foreign-built ships when owned by citizens of the United States or corporations organized under the laws of the United States or of any state; but it excludes such vessels from engaging in the coastwise trade.

A section of the Senate Bill also authorizes the President to suspend the laws requiring watch officers on such vessels to be citizens of the United States whenever, in his judgment, there are not enough citizens of the United States available and qualified to fill such positions. The bill also authorizes the President in his discretion to suspend the "provisions of the law requiring survey, inspection and measurement by officers of the United States of foreign-built vessels admitted to American registry under the Act."

We can contemplate but little advantage to our American cousins on this score. The guerilla warfare of the "Dresden" and other German cruisers in the Atlantic must soon come to an end from lack of fuel alone, and insurance will add but little to the cost of freight.

On the other hand, our ships have the advantage of a return freight, which is not available to United States shipping, and exporters are strongly entrenched in South America. The bulk of the import trade in coal is in the hands of British exporters, who may be trusted to lose no opportunity of maintaining and extending their province. Of course, it is possible that South American shipping may be called into action. Brazil, Argentine, Chile and Peru own about 622 ships, with a combined gross tonnage of 204,473 tons.

But another greater difficulty that meets the American coal operator is the long credit system which prevails in the Southern Continent. The American shipper is not ac-

customed to the c.i.f. basis. . . . It is true that in several cases since the war broke out buyers of British coal, who usually deal on a c.i.f. basis, have consented to clear the freight themselves so as to accommodate the exporter, who still has enormous sums outstanding to his credit, but it is certain that, if we are to continue business, a purely cash system of trading all around is out of the question.

It is important to remember that such coals as those of Pocahontas and New River, and some of the Pennsylvania and West Virginia gas coals, are but little inferior to the best that we can supply. It is an open secret that some of the largest firms of British coal exporters have been heavy buyers of American steam coals during the last year or two. Our impression is that if American coals do reach South America in any quantities, it will be through the agency of these houses. The markets, it may be added in conclusion, are most valuable, and the actual tonnage of coal, which exceeds six million tons per annum, does not by any means represent the whole of this value, for the connection with South America, in which coal forms one link, is of national importance.

A factor that must not be overlooked is the opening of the Panama Canal, which facilitates the transport of American coals to Chile, Peru and Bolivia, at present extensive customers for British and Australian coals.

The U. S. Geological Survey on the Export Question

The exports of coal from the United States have never been large enough to affect the production materially. They amounted to 20,000,000 short tons in 1912 and 23,200,000 tons in 1913, or less than 4 per cent. of the total output of the mines in each of those years. At present, however, while the six European nations that rank next to the United States as coal-mining countries are at war, the demand for export coal from neutral countries is inevitable.

It must be granted that the sale of manufactured products for export is preferable to the sale of raw materials, but there appears now to be a large opportunity for coal export that will not curtail in the least either the domestic supply of coal or the activities of domestic manufacturers. The exportation of coal to South American countries must be of advantage both in establishing trade relations and in insuring a balance of trade in our favor. Already shipments to European and South American ports have begun, and there is demand for authoritative information regarding the quality of the coal from the different fields accessible to the seaboard. How this information can be obtained has already been mentioned on page 9.

OUR COAL RESERVES

As stated by Secretary Lane, "Coal is our one resource about which there need be no present anxiety." In 1908,

Note—Abstract from "Our Mineral Reserves," U. S. Geol. Survey Bulletin No. 599.

Campbell estimated that our reserves of easily accessible anthracite and bituminous coal were more than eleven hundred billion (1,166,527,000,000) tons and that nearly half as much more of the same grades was accessible with difficulty, besides comparable tonnages of sub-bituminous coal and lignite. Five years later a new estimate made by the same geologist, in the light of much better geologic data, especially regarding the extent of the Rocky Mountain coal fields, exceeded these figures by nearly 30 per cent. His estimate of more than 15 hundred billion (1,500,000,000,000) short tons in the United States, exclusive of Alaska, was published in a volume on the world's coal resources resulting from an international inquiry made by the Twelfth International Geological Congress. This publication, in preparing which the geological surveys of the world coöperated, furnished the first authoritative statement of the coal supply of the world, and showed that North America possesses nearly two-thirds of this supply and that the United States alone has reserves exceeding those of any other continent and nearly double those of Europe.

In view of the steadily increasing consumption of coal in the United States the question how long the exportation of coal should be encouraged or continued must be considered at some future time, for it will plainly not be wise to deplete too greatly this reserve of fuel, on which the Nation's industrial life must depend. At present, however, the question of the duration of our coal supply includes so many indeterminate factors that any prophecy as to the date of its exhaustion must be of doubtful value, and it does not now seem at all improvident for us to utilize in some degree this abundant resource as a means of building up our foreign commerce and making new markets for the products of our industries.

Until the present war broke out, Great Britain was the only country that exported coal in considerable quantity, but Great Britain is already beginning to feel the pinch of poverty in her coal supplies, and it is highly probable that when peace is once more established she will place restrictions upon her exports of coal. In 1913, the exports of coal from Great Britain amounted to 82,200,000 short tons, and the bunker trade called for 23,555,288 short tons more. In the same year the exports from the United States, as already stated, amounted to a little over 25,000,000 short tons and the total bunker trade at the principal ports—New York, Philadelphia, Baltimore and Hampton Roads—was only about 7,500,000 tons, indicating that most of the trans-Atlantic liners, the majority of which are English, have been carrying from the other side a sufficient quantity of coal for the round trip.

The high-grade steaming coals of the United States, which would be the ones in chief demand for export trade, are found largely in the eastern half of the Appalachian coal field, which includes the Clearfield, Allegheny, and Somerset districts of Pennsylvania on the north; the Cumberland region of Maryland; the Elk Garden, Fairmont, New River and Pocahontas districts of West Virginia; the southwestern counties of Virginia; the eastern counties of Kentucky and Tennessee; and the Birmingham and other districts of Alabama on the south. Of these coals, those available in highest quality are the semibituminous coals of the Pocahontas, New River, Elk Garden, and Cumberland districts and the better grades

of Clearfield. The fields nearest the seaboard are those of the Cumberland and Elk Garden districts, but these are approaching exhaustion, so that the advantage in this respect will fall to the Alabama mines, which are being made more easily and cheaply accessible by the slack-water improvements in Warrior River, which have already resulted in a marked advance of Mobile as a shipping port.

United States Almost Independent in Mineral Resources

Probably no other nation in the world so nearly approaches absolute independence in respect to mineral resources as the United States.

A glance at the statistics of mineral imports affords a means of comprehending in a broad way how great and complex is the task of attaining national independence in the mining, metallurgical, and chemical industries. Last year the imports of mineral products, both crude and manufactured, exceeded \$270,000,000. Of this total probably \$200,000,000 represents raw materials and crude metals, the value of these imports being about 8 per cent. of that of the domestic output.

In this list of imports the larger items named in the order of value are unmanufactured copper, precious stones, nitrate of soda, copper ore and matte, nickel, tin, iron ore, pig iron and steel, petroleum products, manganese ores and alloys, platinum, aluminum, pyrite, graphite, stone, potash, and magnesite.

This country has an abundant supply of most of these mineral products that are now imported in large amounts, and as to them it can be independent of foreign countries. The only essential minerals of the first rank of which the United States has no known supply at all commensurate with its needs are nitrates, potash salts, tin, nickel and platinum, the list thus comprising two essential mineral fertilizers and three useful metals.

The Coal Markets of Cuba

Coal contracts for the large consumers in Cuba as a general rule are made in the autumn of each year, and are affairs of many years standing. The three largest consumers of coal in the Island of Cuba are: The United Railways of Havana and allied lines; the Cuba R.R., Camaguey, Cuba; and the Havana Electric Railway, Light and Power Co. In addition to these, the sugar mills and mining companies of the island consume large quantities. A complete list of these appears in the Cuban section of the World's Trade Directory, issued by the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington.

The largest importers of coal in Cuba for retail purposes, that is, for ship's use, are the Havana Coal Co. (E. J. Berwind & Co.) and the West Indies Coal Co. The first named, having an extensive plant in Havana for loading and unloading, has almost a monopoly of the business.

One horsepower-hour is equivalent to 2545 B.t.u. per In a pound of Pocahontas or other coal containing 15,000 B.t.u., there is enough energy, could it all be utilized, to supply almost 5.9 hp.-hr. or to raise a weight of one pound 2210 miles against the force of gravity. This energy would lift a 100-ton locomotive 58 ft.

Power Department

The Operation of Rotary Converters at Coal Mines

By C. A. TUPPER*

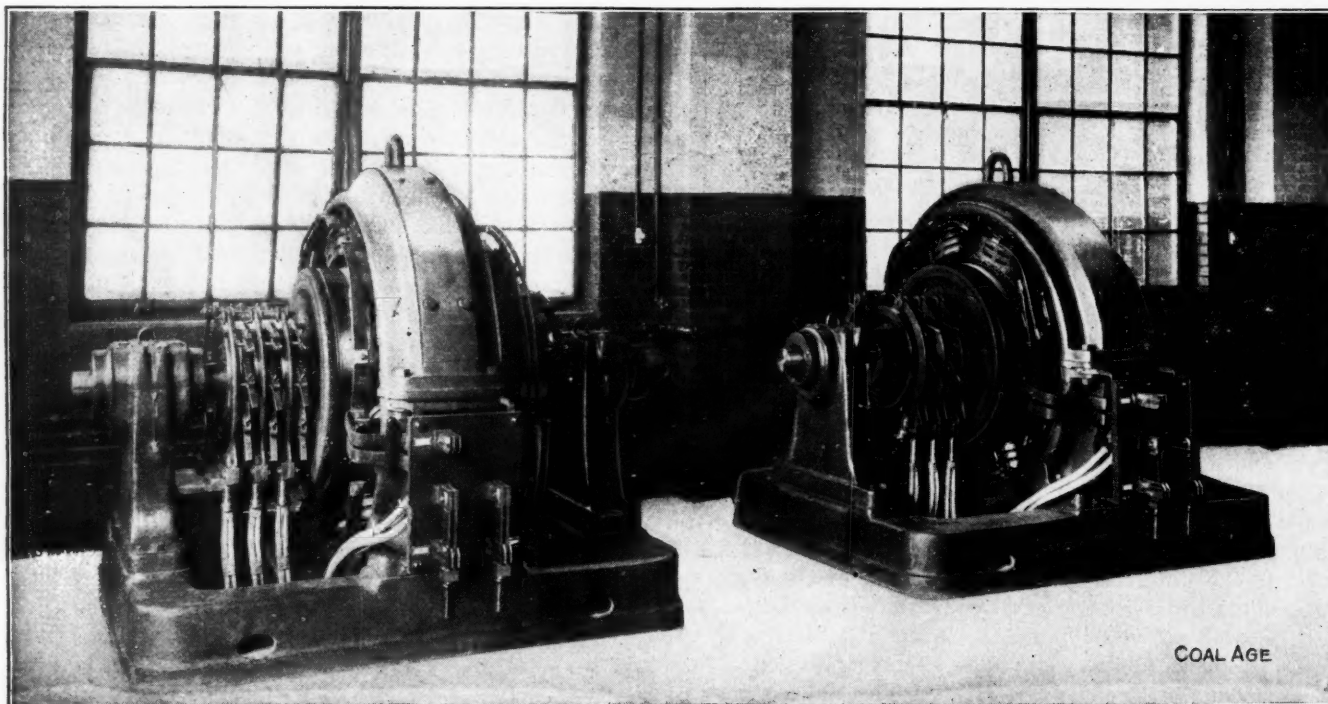
SYNOPSIS—A rotary converter is virtually a synchronous motor-generator set with the frame, field and armature windings common to both elements of the unit. This hybrid among electrical machines must be brought into synchronism with the source of supply before being loaded.

In previous articles, methods of installing and operating generators and motors, both for alternating and continuous current, have been described. These pertain to complete systems, either of the one or the other, while possible links between the two were not considered.

changers have been developed. These are known as the motor generator and the rotary converter. Each is best suited to some particular kind of work, and the choice will depend upon the engineering and economic considerations entering into the problem.

The rotary converter has usually the advantage over the motor-generator set in point of cost, there being but one machine instead of two, and also in respect to efficiency, as both the mechanical and electrical losses are naturally less. In practice, the use of the rotary converter is usually limited to substations from which direct current is distributed, in amounts of 100 to 200 kw. upward; but for this purpose in coal-mining service, it is particularly well adapted. The ordinary installation consists of 300- to 500-kw. machines.

The use of the rotary converter in coal mining is a



TWO 300-KW. ROTARY CONVERTERS. SIX OF THESE MACHINES HAVE BEEN INSTALLED BY THE VIRGINIA POCAHONTAS COAL CO. AT COALWOOD AND JUNO, W. VA.

While, however, the tendency at present, in plants of any size, is to generate and transmit power, even over short distances, as alternating current, the use of continuous-current motors has so far retained its place for certain purposes, as, for instance, coal-cutting machines, underground haulage, electric hoists, surface tramming, or otherwise where variable-speed drive is required, that a considerable proportion of the power generated is still applied through motors operating on such current.

To make possible the use of the two systems in connection with each other, without going to the expense of separate generating plants, two principal types of current

good illustration of the utility of "borrowing" ideas from other lines of industry. It first became prominent in electric-railway, commercial-power and lighting service; then it was taken up in various industrial systems operated partially on direct or continuous current; and from these reached the collieries and finally spread into other fields of mining.

A simple explanation of the rotary converter, which will aid the reader in applying to it many of the rules for installation and care previously given, without repetition in this article, is to regard it as developed in several successive steps.

Taking the synchronous motor-generator set, with its synchronous motor and continuous-current generator, as-

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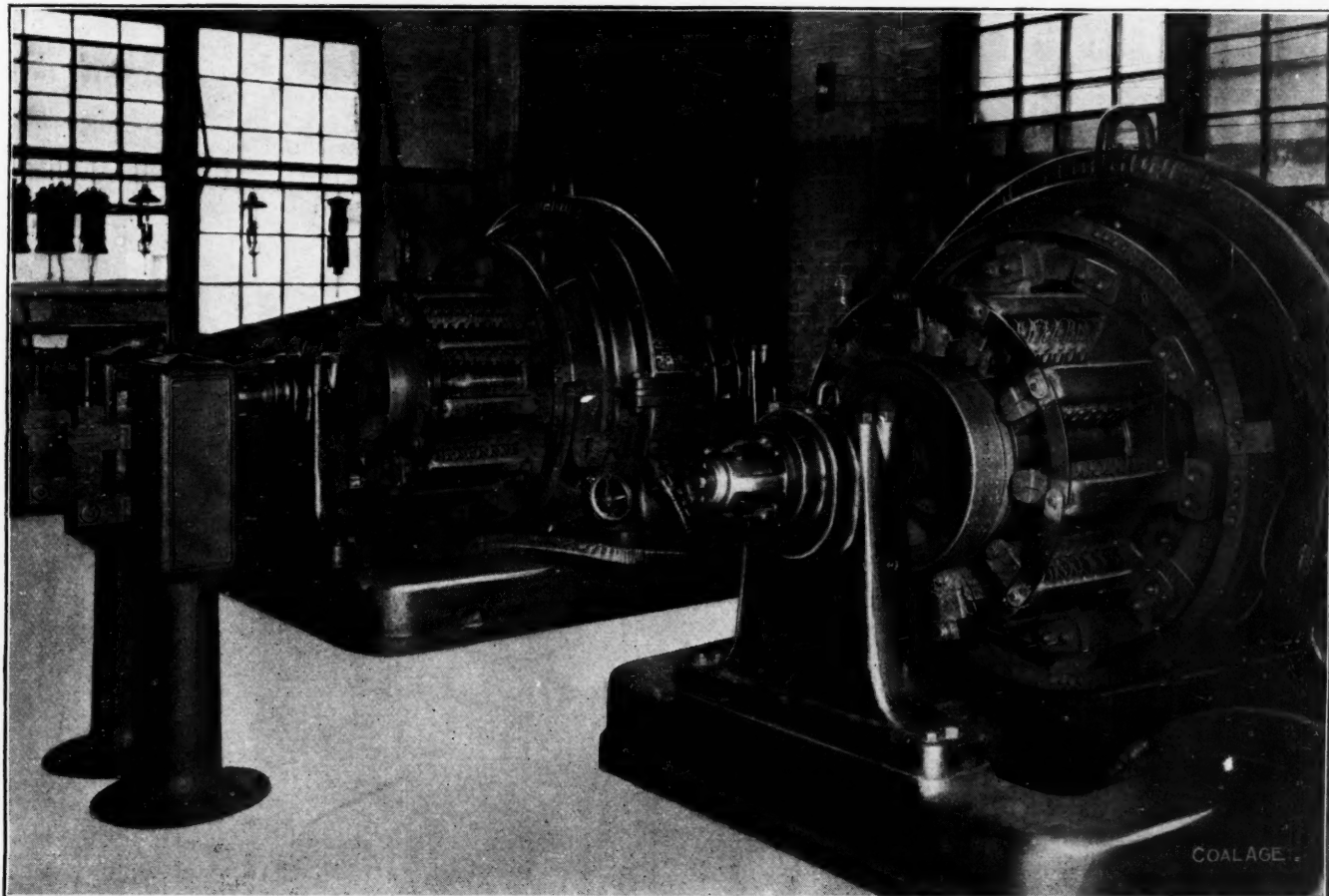
sume that the two armatures are brought side by side on the main shaft, under a single inclosing circle of field coils. Then observe the further simplification which results from placing the two armature windings on the same drum, and finally consider the effect of connecting the two armature windings or using the same winding for both machines. An idea is now obtained of the conditions which exist in the rotary converter. It has been aptly described as a direct-current machine to which slip rings, connected to suitable points on the armature, have been added.

be started; and, as the alternating-current side of the machine is a synchronous motor, it must be brought into synchronism with the central-generating plant before the load is thrown onto the continuous-current side.

First Method—The machine can be started from the continuous-current side when it is connected to a general distribution system.

Second Method—It can be stated by means of a small induction motor, either belted or direct connected to the shaft.

Third Method—It can be started from the alternating-



ROTARY CONVERTERS FOR LARGE COAL-MINING OPERATION, RUN IN PARALLEL TO EQUALIZE LOAD OR BOOST POWER FACTOR

The direct-current voltage of a motor-generator set is independent of that of the supply circuit and can be adjusted as may be desired; but the continuous-current potential delivered by the rotary converter depends upon and is fixed by the electromotive force of the alternating current received through the slip rings, necessitating, in the case of high-voltage transmission, the insertion of a step-down transformer on the alternating-current side.

On a three-phase machine, which is the most common type, the alternating-current voltage is usually about 61 to 62½ per cent. of the continuous-current potential. The same is true of double-delta-connected six-phase rotary converters. For single-phase, two-phase and diametrically connected six-phase converters, the alternating-current voltage is approximately 71 per cent. of that of the continuous current delivered.

THREE METHODS MAY BE EMPLOYED IN STARTING

There are three ways in which rotary converters can

current side by supplying a reduced voltage to the slip rings, as in the case of induction or continuous-current motors.

This reduced voltage is usually obtained through taps on the transformers. When the machine is started by the third of these methods, the field must be broken. This method has this advantage, that the rotary converter automatically falls into synchronism. It will, therefore, be considered first here.

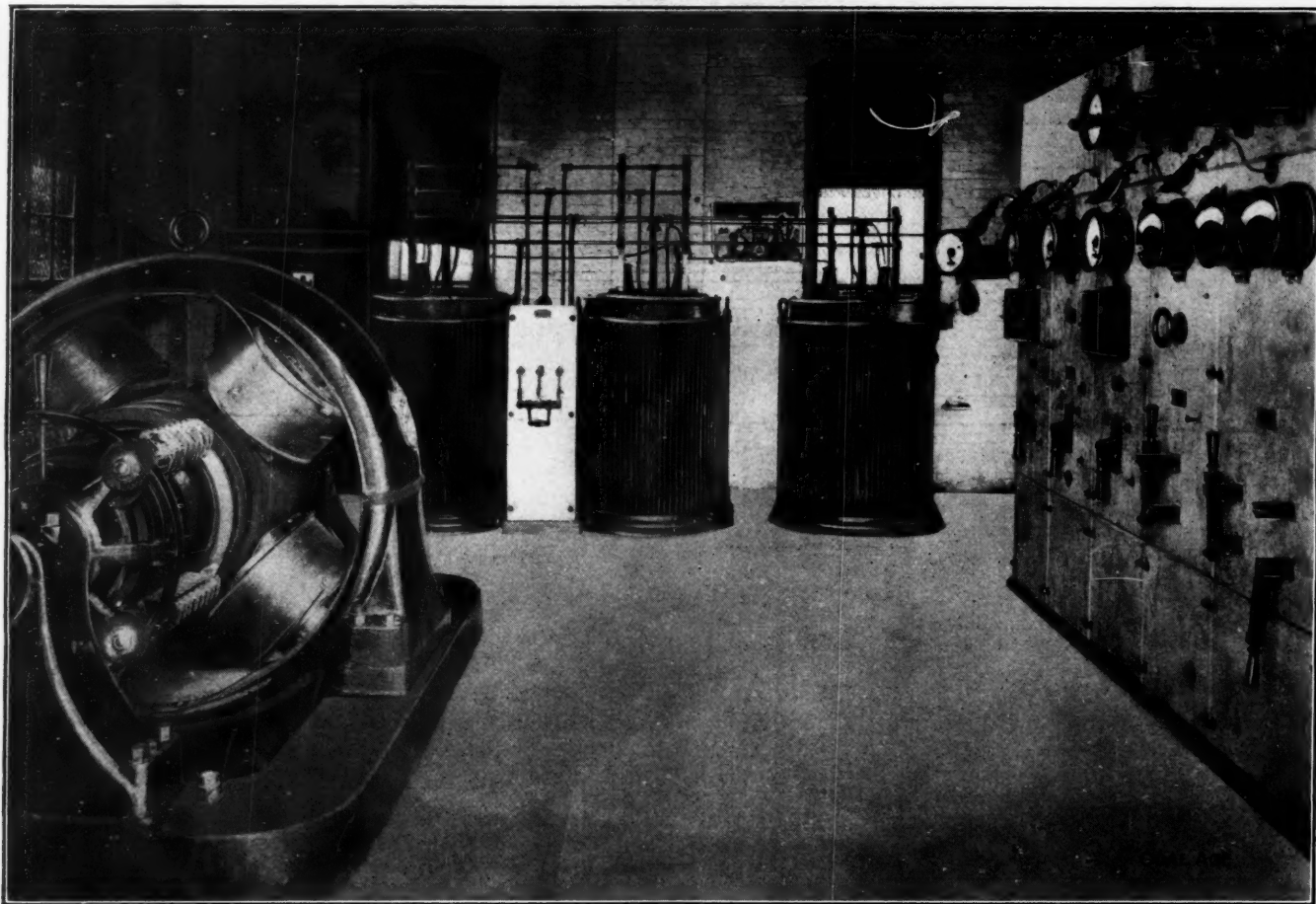
The starting voltage required varies somewhat for the different sizes of rotary converters. It is standard practice in mining, however, to provide one starting voltage only and to make this approximately one-third of the operating voltage on the alternating-current side; but, for the larger sizes of converters and under certain local conditions for which expert advice will be required, it is sometimes desirable to use two starting voltages, approximately one-third and two-thirds of the normal operating potential.

After a rotary converter has been installed and dried out, according to the methods dictated by good practice for *both* alternating- and continuous-current machines, the entire unit should be subjected to a thorough final inspection, to make sure that it is ready for starting. The brushes on the continuous-current side, for example, must be sound and free from chipping, should move freely in the brush-holders and be properly adjusted to the commutator and also be set in the right position with reference to the neutral line. The alternating-current brushes will also need to be adjusted for good contact without cutting the slip rings too rapidly.

It will then be well to examine the interior surfaces of

on the switchboard connected with the operation of the rotary converter, as well as on the starting panel, on the pedestals if used there, and on the rotary converter frame for both the alternating- and continuous-current circuits, should be *open*.

Assuming, then, that we are to start the unit from the alternating-current side, at one-third voltage, the following directions will govern. These are based on the operation of a Westinghouse machine but are applicable to any other make, so far as the apparatus mentioned is used in the plant. Any differences in this respect can be readily detected and the procedure altered accordingly. When in doubt, get expert advice.



A THOROUGHLY MODERN TYPE OF MINING SUBSTATION AT THE YORK RUN (PENN.) PLANT OF THE H. C. FRICK COKE CO. THE CONVERTER IS A THREE-PHASE, 25-CYCLE, 344-355-VOLT MACHINE

the unit, to see that no foreign material has become lodged in it, particularly tools or broken brush carbons, and to be certain that the insulation, especially on the ends of the armature windings, is intact.

Examination of the bearing housings, to make sure that there is plenty of oil in the wells and that the rings are free to turn, should not be omitted.

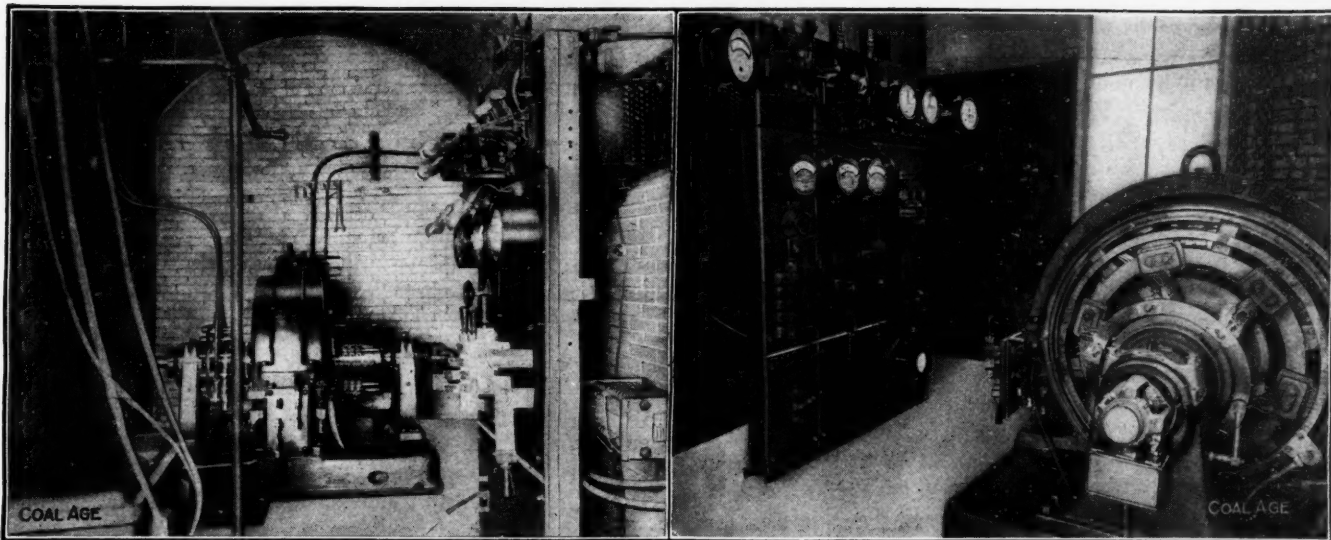
THE SWITCHES SHOULD BE EXAMINED

Finally, the various switches should be inspected, to insure that no one has tampered with them. Above all things, the field break-up switch must be open. If this happens to be closed during starting, a dangerous voltage is certain to be developed. The speed-limit switch must also be open and in good condition, with contacts clean and the spring operative. Furthermore, all knife switches

The rotary converter about to be started, with a single reduced voltage applied on the alternating-current side, is, say, a 3-phase, 60-cycle machine, delivering continuous current for coal-mining service at 250 volts. Its normal speed will be 1200 revolutions per minute.

The preliminary conditions having been complied with, close the oil circuit-breaker on the high-tension side of the transformer and insert the plug for the continuous-current voltmeter. Put the double-throw starting switch up to the starting position; then, when the voltmeter above mentioned indicates the correct polarity, close the field break-up switch in the "down" position, so as to have the rheostat in the field circuit.

As soon as the voltmeter indicates reversal of polarity, close the field break-up switch in the upper position, thus reversing the shunt field and connecting it directly across



A 500-Kw., 60-Cycle, 600-Volt and a 150-Kw., 60-Cycle, 250-Volt Rotary Converter. Both These Machines Are Installed in Colorado Coal Mines

the armature. The indicator of the voltmeter will swing back toward zero. When it reaches that point, throw the field break-up switch again to the lower position.

The unit should come up to synchronous speed in about 30 sec., and lock into step, indicating this condition by a steady current on the alternating side and a steady deflection of the continuous-current voltmeter.

If the voltage comes up with the right polarity, showing that the unit is up to synchronous speed, throw the starting switch down to the running position. If, however, the machine fails to slip a pole and the voltage again comes up with reversed polarity, it is evident that the field induced by the alternating current in the armature is too strong. The starting switch should accordingly be opened momentarily, to permit the machine to slow down somewhat, and closed again in the up position to proceed as before.

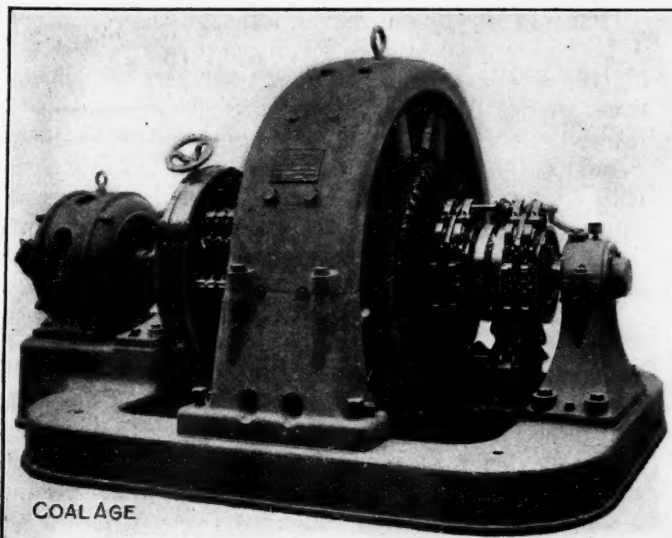
With the rotary converter properly running, adjust the continuous-current voltage to the proper value. Means of varying the voltage, which differ according to the character of the installation, will be referred to later.

If there is a series shunt, close the switch for that circuit, then the continuous-current circuit-breaker, then the equalizer, negative and positive switches. When operating two or more machines in parallel, adjust the field rheostats so as to equalize the load. Finally, make another examination of the bearings to see that the rings are turning and carrying plenty of oil.

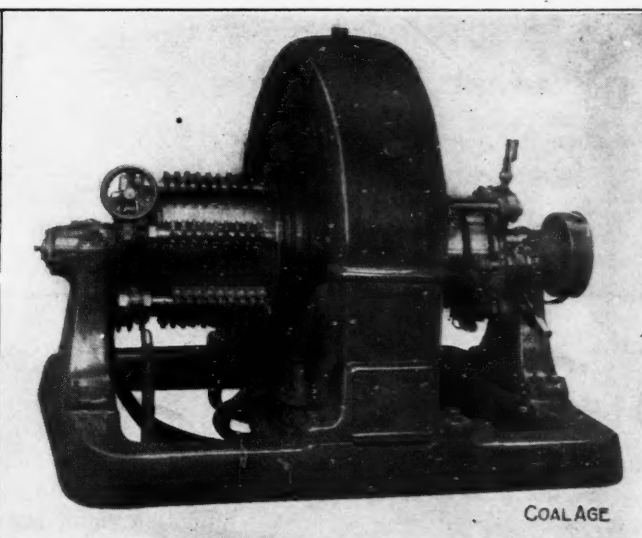
LARGER MACHINES HAVE TWO STARTING VOLTAGES

Where two starting voltages are applied, in the case of the larger machines, the procedure will differ in few particulars from that given above; but there will, of course, be two starting switches to handle. At the beginning, both should be thrown *up* to the starting position, and then the switch connected to the low-voltage tap on the transformer closed to the second starting position.

The time elapsing between these two operations should be such that the swing of the ammeter, when the second voltage is applied, will not exceed that caused by the first starting voltage. This time varies somewhat with machines of different capacities and can best be determined



A 250-Kw., 6-Phase, 50-Cycle, 480-Volt, English Rotary Converter with Starting Motor



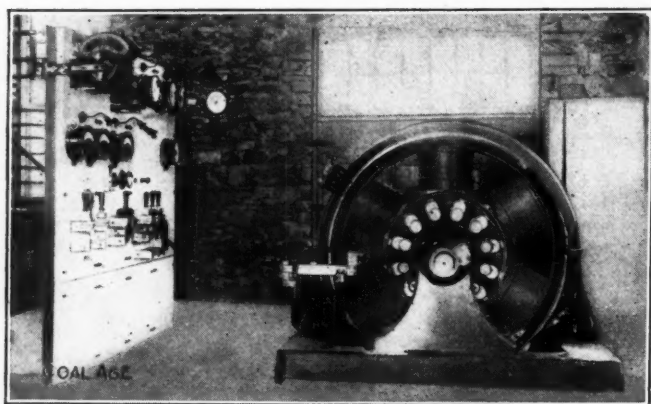
A Standard American Rotary Converter for Coal-Mine Service

by practice. When the rotary converter is up to synchronous speed, the second starting switch should be thrown down to running position and the first starting switch opened. Adjustment of the continuous-current voltage follows, with the remaining course as before.

INDUCTION MOTORS ARE SOMETIMES USED IN STARTING

In practice, it is not unusual to employ a small induction motor to start a rotary converter and bring it up to speed and synchronism with the supply circuit. No separate exciter is necessary, as the converter itself, when put in motion, furnishes continuous current from the commutator. The method of starting is as follows:

First, see that the resistance of the rheostat is all cut in on the field circuit, that the knife switches on the alternating-current side are open and that the oil circuit-breaker on the high-tension side of the transformer is closed, also that the plug for the continuous-current volt-



A 200-Kw., 25-Cycle, 250-Volt, Rotary Converter of the McKell Coal & Coke Co., Sydney, W. Va.

meter and the synchronizing plug are inserted. Then start the induction motor, and thereby the rotary converter, by closing the knife switch controlling the former. Build up the continuous-current voltage to approximately that of the line by adjusting the field rheostat, and slow down the rotary converter to synchronous speed by closing the switch controlling the synchronizing resistance. If the speed becomes too low, open and close the switch until it gets to the point desired.

When the lamps or synchroscope indicate synchronism, connect the rotary converter with the supply circuit on the alternating-current side, by closing the switch or switches—there being two in the case of six-phase double-delta connection—and open those controlling the starting motor and synchronizing resistance. Adjust the field rheostat to obtain the minimum current in the alternating-current circuit, and then proceed as above recommended for self-starting.

As will be gathered from the foregoing, this auxiliary induction motor is wound for a speed slightly in excess of that for which the rotary converter is designed, and the method above outlined simply means that the latter is brought down to synchronous speed by loading one of the phases through a suitable rheostat. This method makes the process of synchronizing exceedingly simple, and, as the power developed by the induction motor need only be about one-tenth of the full load output of the rotary converter, the additional cost for its installation should not be excessive.

SELF-STARTING IS ADAPTABLE TO LARGE SIZES

Of the methods described, self-starting from the alternating-current side would seem to be best adapted only to the smaller sizes of machines, say 300 kw. and under, while a starting motor has been generally thought advisable for the larger units. In practice, however, self-starting has become practicable for even the largest machines and is now common. The chief objection to it, originally, was the rush of current from the supply mains, amounting to about three times the normal full-load consumption of the rotary converter, and, since this current was much out of phase with the supply pressure, the regulation of the entire system was seriously affected. The method outlined above, which insures that, before switching on the supply, adequate provision is made for reducing the voltage across the slip rings by taking intermediate tappings from the low-tension side of the step-down transformer, has overcome that difficulty.

STARTING FROM THE DIRECT-CURRENT SIDE

Where there is connection to an independent supply of continuous current, say the exciter system of the main generating plant, any rotary converter can be started from the commutator side. This is a simple matter, and the method is similar to that used for an ordinary shunt-wound or compound-wound continuous-current motor.

The rotary converter is then synchronized by varying the field excitation until the correct speed, as indicated by the lamps or synchroscope, is obtained, when the switches on the alternating side can be closed, making the connection to the supply circuit. If the latter is 3-phase, it is usual to close one of the switches first; and then, at the moment when synchronism has been attained, the other two are thrown in.

In cases of emergency it is possible—although never advisable when it can be avoided—to omit the process of synchronizing. The rotary converter will then be run up to a speed slightly above synchronism, as when started by an induction motor, the continuous-current switches opened and the alternating-current switches immediately closed to make the connection to the supply circuit. The machine will pull itself into step and as soon as that has been accomplished the switches on the continuous-current side can again be closed.

It should also be stated that, although the rotary converter has thus far been considered in this article as taking the supply from an alternating-current system and transforming it to continuous current, the machine is readily reversible and can be supplied with continuous current at the brushes, in which case it will give out alternating current at the slip rings. Thus, if there are independent alternating- and continuous-current generating systems, the rotary converter can be made a load balancer between the two.

When, however, a rotary converter is feeding into an alternating-current system and running in parallel with synchronous generators, some difficulties may arise, due to the absence of armature reaction in the machine. In that respect, it differs materially from a synchronous generator or motor. Lagging currents on the alternating side will, therefore, tend to weaken the field and produce a condition of instability which may cause a falling out of step. This, however, can be overcome by special methods of field excitation.

For ordinary operation, in supplying direct current,

this absence of armature reaction—or the fact that it is practically negligible—is an important advantage; for, with a fluctuating power load, the pull on the machine can be varied enormously. Instances are recorded of temporary overloads in excess of 300 per cent. of the regular load, and the carrying of 100 per cent. overload for considerable periods.

Interpole Motors for Mine Locomotives

By A. R. ANDERSON*

On May 9, 1914, I presented an article in the COAL AGE on "Interpole Motors for Mine Locomotives," which has been criticised in the Sept. 19, 1914, issue of the same magazine by Messrs. R. E. Hellmund and W. A. Clark, who do not see fit to agree with the views expressed in the original paper.

Of course, it was not expected at the time this paper was written, that it would meet with the approval of all readers, neither was it expected that any argument such as that presented could convince anybody whose experience with noninterpole motors was so entirely unsatisfactory as the experience of these two gentlemen evidently has been. I am not surprised that those whose experience with noninterpole motors leads them to say "the absence of interpoles and consequent poor commutation" should thus vigorously advocate the use of interpoles.

The experience of the writer, however, and the comments which he has heard made by practical men in the coal-mining industry stand in marked contrast to the evident experience of these two gentlemen. In fact it was the observation of the generally excellent commutation of properly designed noninterpole mine-locomotive motors, and the polished condition of the commutators of such machines, especially where ball bearings were used, that prompted the writing of the first article.

Even further, the writer's experience has extended to noninterpole motors of the same general design and a comparison between the commutation of interpole and noninterpole motors left the impression that the application of interpoles was labor lost. Of course, the commutation with interpoles was excellent; so it was with no interpoles, and it was on such observations as these that the original paper and arguments contained therein were based. I am sure that had the gentlemen who criticized this paper had the opportunity of seeing as much of good noninterpole motors as the writer has had, they could not conscientiously have given utterance to the phrase, "the absence of interpoles and consequent poor commutation."

It is the privilege of any manufacturer of mine locomotive motors to build them either with or without interpoles as he may see fit, since there are no fundamental patents standing in the way. The original article on this subject was an attempt in a broad analysis of mine-locomotive motors and the conditions under which they worked, to show why nothing was to be gained by the application of the interpole motor over a properly designed noninterpole machine.

The statement made in the first article in regard to the horsepower rating of the machine, depending almost entirely upon the size of the motor carcass, will bear repeating:

"Motors of the railway type are totally inclosed; they

are rated on the one-hour basis, and since there is practically no difference in efficiency between interpole and non-interpole motors, the amount of heat to be radiated for a given horsepower is practically the same in both cases and the dissipation of this heat within a given temperature rise requires a machine of practically the same size in both cases."

Thus the horsepower rating permissible on a motor of given dimensions, will be the same for both, whether interpole or noninterpole, and these dimensions generally permit of the design of a noninterpole machine with good commutation.

Keeping in mind that the subject under discussion is motors for *mine locomotives*, it is a little surprising that the gentlemen who criticized my article should submit a value of 40 per cent. for the coefficient of adhesion under mine conditions. It may be possible under exceptionally favorable circumstances to reach such a high value with soft tires, sharp, dry sand and a heavy rail, but it has been my experience that under actual mine conditions a coefficient of adhesion of 25 per cent., which is generally accepted for steel-tired wheels, is very close to what is actually obtained.

It is only rarely that this coefficient of adhesion is considerably exceeded. If it were possible to obtain such a coefficient greater than 25 per cent., the manufacturers would certainly take advantage of the higher rated draw-bar pull which this would place on their locomotives.

Another point then that will bear repeating is the statement that a properly designed mine locomotive can be and should be over-motored. For example, the Jeffrey Manufacturing Co. is building locomotives regularly, in which the motor capacity is such that at full normal rated load on the motors, the tractive effort capable of being developed by the machine corresponds to a coefficient of adhesion well over 30 per cent., having been, in many cases, as high as 44 per cent.

It is by no means true that all locomotives at present available to the trade may be overloaded when the coefficient of adhesion is as high as 30 to 40 per cent. A locomotive can and should be over-motored. Then the proper weight of locomotive is selected for the duty required, and regardless of the territory on which it is to operate, the machine will always have ample motor equipment.

Train resistance has absolutely nothing whatever to do with the draw-bar pull and motor equipment of a mine locomotive. If the train resistance is great, it simply means that a locomotive of given weight cannot haul a great load. The subject of train resistance is absolutely irrelevant material in the discussion of locomotive draw-bar pull and motor equipment.

Although it is possible to build certain sizes of railway motors with only two commutating poles, there are a great many sizes in which four such poles must be employed, and where this is the case, it is impossible to connect a reversible motor with fewer leads than shown in the diagram in my original article.

Any figures which may be submitted on the life of brushes and commutators are almost meaningless. To make such data of value, the mechanical construction of the motor, the grade of brush used, and the conditions of service to which the locomotive is put must be very definitely known.

The length of life of brushes and commutators on non-interpole emotors, which have come under my observation, have been very satisfactory, and I doubt if either could be greatly prolonged by the application of interpoles.

*Electrical Engineer, Jeffrey Mfg. Co., Columbus, Ohio.

Who's Who in Coal Mining

Herbert C. Campbell

There is plenty of room in the coal-mining industry for young life and blood, and quite a few of the so called second generation are availing themselves of the opportunities presented. The fallacy that only age and long experience are to be trusted has been exploded, and the world is better for it. Many corporations, once great, have gone to seed, simply for lack of the hope and enthusiasm that youth imparts. Great successes in mining as in all industrial and commercial life are but "dreams come true," and it is the air castles of our young men that materialize into the realities of our actual everyday existence.



H. C. CAMPBELL

Our hard-headed, philosophical friends are always telling us of how hopeless is the future of the young man afflicted with a rich daddy. The handicaps, they say, are insurmountable, and even if the son himself isn't a pin-head, his environments are so unreal, so artificial, that all possibility of individual achievement is completely destroyed.

In the case of Herbert Campbell who was born in Kansas City, a little more than 30 years ago, the outlook, measured by above standards, was unusually dark. There wasn't any fake about the quality of the spoon in his mouth when he first saw the light of day. The article was solid silver and quite heavy at that. However, the family decided to take a chance, and the work of rearing the young man commenced. It so happened that the late Chas. Campbell, Sr., father of the boy, had ideas of his own concerning many things, among which were some data pertaining to laws, rules, regulations, and safety precautions relative to raising a boy in the U. S. A. Several times when Herbert wandered beyond the danger

sign of the fireboss, Campbell, Sr., sent out a rescue corps, and later when alone, himself applied the first-aid measures.

As a result of such solicitous care, Mr. Campbell, Jr., became cautious, absorbed an education at St. Paul's School in New York, and on receiving his diploma, hurried back to Kansas City, arriving there in time to report on the morning shift. That same day, long before noon, the following entry was made on the books of the Central Coal & Coke Co.: H. C. Campbell, clerk, auditor's office.

They say the reason he was placed in the auditor's office was to teach him that the best opinion of responsible people in America favors the plan of demanding and getting 100c. in value for every dollar expended. It's good training for a young man to see, think, and talk all day about sums of money representing many thousands of dollars, and then after work, have to walk 37 blocks to save 5 cents.

At any rate, the drilling in the auditor's office was so comprehensive, and Mr. Campbell's conduct was so exemplary, that the company decided to remove all his illusions concerning the color and characteristics of coal, and forthwith ordered him to their mines in the Arkansas field, tempering their verdict of "guilty" by listing him on the payroll as assistant superintendent of the Arkansas mines.

Right here let me say it would be a good thing if all coal-company auditors were sometimes lifted gently but firmly from their office chair and conveyed without delay to the place where the coal is mined. Arriving there, they should be inclosed in neatly tailored overalls and jumper, and a delicately carved utensil commonly spoken of as a shovel should be placed in their hands. Next we have a pile of coal just shot from the face, an empty car, a starter's pistol and a recording stop-watch. I'm sure the picture is complete.

And that isn't all. It is just as essential that mine superintendents be subjected to an occasional change in climate. They might with advantage recreate in the auditor's office, punch a time clock, wear a fancy vest, a stiff collar and swear off swearing. To make the super feel at home amid his new surroundings, someone might be specially designated to blow coal dust in his face, singe his hair and drop a light weight of some kind on his head, all at stated intervals. The benefits of such a change are obvious.

But returning to Mr. Campbell, his stay in Arkansas was ended when the "big boss" appointed him assistant superintendent of their Kansas mines. This job kept him busy for three years, when he was advanced to the more responsible place of assistant manager of all the company's coal properties. Five years have elapsed since this last advancement, and they say out West that Herbert is making good with both feet. True, he found it necessary to run over to Kentucky and carry off for his very own a blushing Southern bride. But this is the only time he ever weakened, and since the company's punishment was inflicted in the form of a raise in salary, no great damage was done.

Mr. Campbell is a director of the Campbell Glass & Paint Co., and a director of the East Oregon Lumber Co. The Country Club, Blue Hills Golf Club and Commercial Club, all of Kansas City, list him as an active member. He is likewise interested in the work of the Rocky Mountain Coal Mining Institute, having played the part

of host on the institute's stop at Rock Springs in June, 1913.

There is no more popular young man in the coal industry of the Middle West than "Herb" and no one who is more democratic.

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Extracts from a Superintendent's Diary

It falls to my lot to witness often the gullibility of the average human.

We mining men have a way of shrugging our shoulders and smiling whenever one of our friends in town mentions some newspaper or magazine article dealing with an event at a mining camp, because we have come to know that such articles are always either greatly exaggerated or are ridiculous. But of late I am beginning to realize that such things are not always chargeable to malice and ignorance on the part of editors, but rather to their reporters, who swallow highly colored facts that are volunteered to them by the average mining-town citizen.

It has always been the policy of men in charge of large mining operations to talk as little as possible and it naturally follows that whenever newspaper reporters want to work up a feature story, they waste little time on bosses, but rather fall back on the talkative ones, whatever their prejudices and position may be.

That's where the fun begins if the miner encountered is possessed of a sense of humor. He does not stop to think of the possible effect of a published story built up on the statement he is volunteering, but only anticipates the laugh he will have on the reporter and then later on his acquaintances in town.

I have accompanied numbers of people into coal mines on their first trip and I have yet to see one who was not in a mood to believe most anything that might be suggested, if accidentally left in darkness for even a moment.

I always recall in this connection a sentence from one of Stevenson's essays: "Certain dark gardens cry aloud for a murder; certain old houses demand to be haunted; certain coasts are set apart for shipwreck."

A young reporter arrives at a camp in search of a story; although he has never been near a mining camp before, he feels that miners must be a pretty brave lot to hazard death by explosions, fires and all of the other terrible things that happen around them. And being a pretty decent sort of a chap, he plainly shows his admiration for all of the smutty-faced miners who pass him on their way from the pit mouth. Later on, at the boarding house, he gets on friendly terms with some of the younger men and they exchange confidences. Gradually they begin to realize that they are heroes in this young fellow's eyes and, unconsciously, perhaps, by word of mouth, they begin to live up to expectations.

Many of the terrible tales (imaginative) of hardships imposed by employers can be traced back to such interviews, as can also tales of wanton sacrifice of men due to failure on the part of those in power to adopt well known safeguards.

During strikes, the encounters between the "thugs" (the romantic name for mine guards) and the miners, as told by the miners to the reporters, take precedence over the ordinary adventures inside, and here again the

same influences can be detected if one reads between the lines.

I am reminded of all this by a conversation I overheard tonight between our boss driver and a young cousin of his who is here on a visit from a distant farming section. The driver remarked that today he cut into an old room in the mines (he has to my knowledge never cut anything larger than a piece of pine and never used anything for cutting heavier than a pocket-knife) and found himself facing a skeleton. They were probably the bones of a victim of an explosion that occurred years ago. "We miners must always keep our nerves keyed up to expecting something of that sort," was the way he ended the narrative.

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A Dust Arrester for Drilling and Boring Machines

Much attention is being paid at present to the avoidance of free or floating dust during drilling or boring in stone, coal or other materials. One method of attacking this problem is by directing a spray of water onto the part where drilling is in progress, but this is not always possible, unless a supply of water is easily available.

An alternative arrangement which has been introduced by Holman Brothers, of Camborne, England, under the patents of M. T. Taylor, consists of providing the drilling or boring machine with a means of arresting and collecting the dust so that it cannot permeate the air.

The boring tool is provided with a cup or receptacle slipped over the shank and having a soft-edged mouth, which accommodates itself to the rock surface when pressed against it. The soft edging at the mouth of the receptacle is secured by a sponge collar or gasket.

At the lower part of the receiver a nozzle is arranged, from which the dust is led away through a hose into bags or a water trough. A gland closed at the lower end by a rubber washer fits around the drill.

The machine when it commences to bore compresses a spiral spring, which butts against the cup receiver and forces it against the rock surface and the dust on coming out of the hole, being unable to make its escape because of the soft edging, passes away through the dust-collecting duct into the receptacle provided.

The whole arrangement is extremely simple, and easily applied, its simplicity of application is a strong point in its favor, inasmuch as the average miner is prone to give but little attention to his physical condition if such attention involves any extra trouble in the operation of his equipment. It is to be hoped that with the introduction of dust-allaying devices, miners' phthisis, of which so much has been heard in recent years, will be done away with, or at least effectively curbed.

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Extracting Benzine from Coal

A new electrical process for extracting benzine from coal has recently been invented by a Swedish engineer, Mr. Vidstrand, of Stockholm; the costs of manufacture are said to be considerably lower than those with the methods now employed, and the product is stated to be as good as any fuel for motor cars. The process has been patented in eighteen countries and the inventor is carrying on negotiations with a group of Norwegian financiers with the view of disposing of the patent rights for Norway.

Editorials

Picking the Winners of First-Aid Contests

It will serve no good end for us to disguise the fact that there is a degree of uncertainty as to the quality of decisions in first-aid contests. There is no question but that an element of chance does enter in, and that not infrequently a team which does not deserve the fewest demerits carries off the palm in competition with teams whose execution is more perfect. And in this we have reference to no specific contest, nor to any particular series.

It is no great misfortune if a team entitled, we will say, to fifth place receives only seventh prize, nor if one entitled to a prize of low order is deprived of all award. But among the first three or four teams where competition is keen, the uncertainty in the result, due to faulty judging, is a matter of considerable discouragement, and eventually it will serve to reduce the interest in contests and limit the distance which contestants are willing to travel to attend meets. For crack teams will go a long way if only the award is sure to fall to the team of greatest merit.

We do not believe the interest will flag if one or two teams are invariably winners, so long as the contests are known to be fair. The international yacht races have lost little of their charm, though for years the American yacht has carried off the cup. But if a doubt were to arise in that nautical event as to the relation subsisting between success on the one hand and excellence of design and seamanship on the other, then the race would be deemed a useless event, and the sporting world would hardly maintain its interest from year to year.

Consequently, we think any method of performance and judging which will give the best team first place will serve a useful purpose and make the prizes obtained a cause of real gratification to the teams securing them.

We would suggest, therefore, that the events in which the contestants all enter, be regarded as elimination trials. Every capable judge should serve who can possibly be secured. There should, if possible, be as many judges as teams, and the men acting in that capacity should be, as far as may be, not only physicians, but men also having first-aid contest experience.

They should discuss the events beforehand and should agree on the preferable technique, and moreover they should decide what demerits they will give for any deviation from the desired procedure. Of course, the judges should be rotated and should not be connected, even remotely with any of the contesting teams. They should watch the manner of operation, as well as observe the final result. Moreover, a list of rules, far more complete than those we now have, should give the competitors a knowledge of what is expected.

But when all this preliminary judging is done, the first three or four teams should be selected for a final contest. So many of the judges we are obliged to employ are not mine physicians, for most of those who are interested

enough to attend have teams entered. The local doctors in general practice have not studied first-aid as a science, and moreover do not know how to spot errors in technique as readily as do those who have trained teams for months or even years. Consequently, assuming a doctor can and does observe every move, the judgment of one of the judges may easily be slightly in error, and moreover, the lenience of one judge often wins a close contest.

In order that the winner may be the best team, we propose a final contest for the leading contestants. One team should be chosen to perform a certain event in the presence of all the judges. This event should not be pre-announced. The other final contestants should be removed from the field, and when the first team has finished the final, the others, one by one, should come forward to perform the same event in the presence of the same judges. The award of the whole bench would be regarded with favor and confidence, and the fact that several teams had been already eliminated would probably make it possible to have the judging bench consist wholly of the medical directors of teams already out of the contest.

It may be objected that this will take time. It will, but where rescue work forms a part of the meet, the final first-aid contest could take place concurrently with the rescue events.

We believe that such a system will lead to great advances in execution and to discussions of technique more valuable than have yet arisen. The hurry on the field before the main contest makes it hard to get the careful consideration necessary to determine just how some six separate events should be conducted. So far the American Mine Safety Association has done only a small part of the work needed in formulating rules for action in the field, and there is a large degree of uncertainty as to whether demerits will be awarded for certain methods presented. If the rules of the game are undecided, and the ideas of each judge are the final laws for the teams he inspects, then there can be no confidence, and without confidence there can be no real contest.

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Our Commercial Relations with Brazil

Ever since James G. Blaine, while secretary of state, attempted to establish a better political understanding with the various other nations of the new world, there has been a persistent feeling among Americans that this country should have a closer commercial relationship with our sister republics to the south. The present conflagration in Europe has afforded our first real chance to cultivate and foster such a relationship. Fate, unbid and unsought, has laid opportunity at our door.

Of the two great South American republics by far the larger in land area is Brazil, and unlike all other countries in America, the language there spoken is Portuguese. In spite of the discoveries and contributions to our geographical knowledge made by our well known and intrepid ex-president along the "River of Doubt," Brazil is

nevertheless about the only country in the world today across the map of any considerable portion of which may be written the word "unexplored."

Notwithstanding the fact that perhaps the major portion of the area of the country is virgin forest or wild land, Brazil has a population of about 22,000,000 people. It has also approximately 15,250 miles of railway and many thousand miles of navigable rivers.

The gradual increase in the exportation of the products of the country which has taken place for some considerable time past was not continued during last year, the total value of exports decreasing from \$362,245,951 in 1912 to \$313,628,078 in 1913. This decrease is accounted for by the lower market prices paid for coffee and rubber, the two products which for many years have constituted over 80 per cent. of the country's export.

The United States is the largest purchaser of Brazilian products, absorbing more than Great Britain and Germany put together. Besides purchasing 36 per cent. of the exports of coffee, this country buys the bulk of the Brazil nuts, cacao, carnauba wax, manganese ore and skins exported. On the other hand, we sell to Brazil only about one-third as much as we buy.

So far as we are able to learn, of coal or other solid mineral fuel, Brazil produces none or practically none. Throughout the rural districts, particularly in the states of Pernambuco and Sao Paulo, where sugar is a staple product, the mills almost exclusively burn wood and bagasse under the boilers. The same is true also of the domestic fuel consumed. Wood is, however, rather expensive and is becoming more so from year to year.

During the year 1913, Brazil purchased coal to the value of \$19,505,066 and patent fuel or briquettes to the amount of \$2,668,068. Of these amounts the United States furnished coal to the value of \$2,162,098, while Great Britain furnished almost the entire balance.

Approximately 75 per cent. of the imports into Brazil come from the United States, Great Britain, Germany, France and Argentina. The percentages of these countries being 15.7, 24.5, 17.5, 9.8 and 7.4, respectively. These importations consist mainly of arms and ammunition, breadstuffs, cotton and cotton manufactures, coal, clocks and watches, chemicals and drugs, vehicles and accessories, electrical machinery and supplies, fish, fruit, glass, scientific instruments, iron and steel manufactures, leather and leather goods, meats and dairy products, musical instruments and accessories, naval stores, oils, paper and manufactures thereof, vegetables, wood and wooden goods, and miscellaneous articles of various kinds.

During 1913, Brazil exported products to the five countries previously mentioned, valued as follows: to the United States, \$102,436,302; to Germany, \$44,333,640; to Great Britain, \$41,650,331; to France, \$38,637,801 and to Argentina, \$14,830,127.

The principal articles exported consisted of Brazil nuts, bran, coffee, cacao, cotton, cotton seed, carnauba wax, gold, hides, manganese ore, monazite sand, precious stones, rubber, skins, sugar and tobacco. Of these, the United States took the major portion of the Brazil nuts, coffee, cacao, manganese ore, rubber and gems.

In the number and tonnage of vessels, both steamships and sailboats entering Brazilian ports in 1913, the nations other than Brazil in order of their rank were Great Britain, Germany, France, Italy, Austria and Hol-

land. Ten steamships and three sailing vessels, having a gross tonnage of 37,057 and 2448, respectively, are listed as being North American. It is doubtful if even one of them flew the Stars and Stripes.

Extensive improvements on the docks at Rio de Janeiro, where all vessels entering the port now come alongside, have been completed, together with modern warehouses and coal- and ore-handling apparatus.

Brazil is naturally one of the richest countries in the world, but her wealth lies almost wholly in her soil and climate. She has a diversity of products such as this country could well use. Something like 300 different kinds of useful woods including such varieties as ebony, mahogany, Spanish cedar, iron wood, ivory wood and bamboo, might be to advantage exported to this country for furniture manufacture. Her supplies of fuel are, however, deficient, and it is believed that henceforth coal, coke and briquettes will form an ever increasing portion of Brazilian imports from the United States.

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A Big Slump in the British Exports

The figures for the British exports for the first month of the European war show the expected heavy decline. The gross exports of all kinds, including fuel, fell off 45 per cent. in value, as compared with the same month last year. It should also be remembered in this connection that these figures do not show the full force of the curtailment for the entire 30-day period. The declaration of war only occurred on Aug. 4, and it was a number of days after this before the complete cessation in shipping became effective. It is only fair to state in this connection, however, that much of this enormous falling off is due to unwarranted apprehensions among those in the affected industries and also to the disruption of the customary channels of business; it is, therefore, fair to assume that much of this is of a temporary character.

The fuel exports experienced a particularly heavy decline, the gross for the month aggregating only about three million tons, or about one-half normal. The most interesting and significant phase of the British export figures to the American operators, is the enormous decrease in the South American shipments. The August exports to the Argentine Republic amounted to only 98,344 tons, as compared with 290,741 tons for the same month last year, and 312,387 tons in 1912. In this one instance, therefore, we have a flat loss of nearly 200,000 tons, which cannot now be made up with anything except American coal.

While this is perhaps the most important tonnage that American operators can expect to obtain, there are other possible contracts involving relatively large volumes of coal. For instance, the British exports to Uruguay decreased from 72,006 tons in August, 1913, to 39,103 tons in this year, the relative figures for Brazil for the same period being 111,504 and 48,983, respectively.

The greatest decline in British exports, very naturally, was to Germany, the figures for August, 1913, being 798,177 tons, as compared with 132,026 tons for August of this year. It is interesting to note, however, that the shipments to Russia have suffered almost equally as much, decreasing from 769,794 tons in 1913, to 169,353 tons this year.

Legal Department

Forfeiture of Coal-Mining Leases

By A. L. H. STREET*

SYNOPSIS—Although an agreement authorizing forfeiture for breach of a material condition will be enforced by the courts, the decisions are not uniform as to whether breach of the lessee's implied obligation to diligently carry on operations will sustain an involuntary cancellation of his rights. Right to forfeiture may be lost through the lessor's acquiescence.

One of the legal phases which frequently arises in coal-mining litigation is that pertaining to the right of a landowner to forfeit a coal-mining lease granted by him, for default on the part of the lessee—usually failure to commence or continue mining operations. In showing the policy of the courts on this question, I leave out of consideration cases which involve abandonment of a lessee's rights, confining myself to instances in which there is no showing that he ever intended to relinquish his rights—an essential element of abandonment.

Although all the courts probably agree that, even when there is no express covenant on the lessee's part to commence operations within any particular time, he is impliedly bound to work the property with a reasonable degree of diligence. And judicial authority is unanimous to the effect that a right of forfeiture for breach of a material covenant on the lessee's part, *expressly* reserved, will be enforced. The judges disagree, however, on the proposition as to whether breach of such an *implied* obligation will afford the lessor the right of cancellation. The Circuit Court of Appeals and the appellate courts of North Carolina and Virginia have sustained this right, while it has been held in other jurisdictions, including Ohio and Pennsylvania, that, in the absence of express reservation of the right of forfeiture, it does not exist. Under the latter view, the lessor's only remedy is an action for damages.

LEADING DECISIONS CITED

In the case of *Smith vs. Eagle Coal & Mercantile Co.*, 155 Southwestern Reporter 886, the Missouri Court of Appeals recognized the right of a lessor to enforce an expressly reserved right of forfeiture for failure of the lessee to pay royalties, or for suspension of operations for more than sixty consecutive days not attributable to strikes, car shortage or legal proceedings. But in this case a forfeiture was refused because it appeared that a suspension of operations relied upon by the lessor was due to a strike.

In the case of *St. Louis Union Trust Co. vs. Galloway Coal Co.*, 193 Federal Reporter 107, the United States Circuit Court for the Northern District of Alabama announced the following principles:

Shortage in the payment of royalties is no ground for forfeiture, if innocent and if the lessee offers to pay the

full amount due. Making of a mine-working contract by the lessee with a third person does not constitute a violation of a stipulation against assignment of the lease without the lessor's consent, so as to entitle the latter to enforce a forfeiture on that ground. Nor did use of narrow work in the removal of coal from adjoining land forfeit the lessee's rights. No forfeiture will be declared for claimed failure to properly develop the property, if it appears that the lessee has proceeded in good faith, and if the proper manner of development was largely a matter of judgment.

FORFEITURE FOR UNREASONABLE DELAY

But, where a lessee agreed to commence operations within one year from the date of the lease and continue developments to ascertain whether the property could be profitably worked, the lessor was entitled to forfeiture on showing that for 24 years the lessee had failed to proceed. (*Kentucky Court of Appeals, Diamond Mining & Developing Co. vs. Sellars*, 136 Southwestern Reporter 1016.) In a similar case (*Brown vs. Wilmore Coal Co.*, 153 Federal Reporter 143), a lease was canceled as being a cloud on the lessor's title, where the lessee had failed to proceed with operations for 20 years, although mining was extensively carried on in the vicinity in the meantime. But the Kentucky Court of Appeals refused to decree a forfeiture because a lessee failed to commence operations within ten days and failed to do the development work required by the contract. (*Ross vs. Sheldon*, 119 Southwestern Reporter 225.) This decision was influenced, however, by the facts that time for commencement of the work was not made of the essence of the contract, no right of forfeiture was expressly reserved, and the lessee acted in good faith, having been delayed in his operations by illness and a temporary difficulty in obtaining necessary funds. It was further decided in this case that a lessee is not chargeable with delays arising after lessor brought suit to terminate the lease.

In *Price vs. Black*, 101 Northwestern Reporter 1056, the Iowa Supreme Court refused a forfeiture where it appeared that the lessor had acquiesced in a delay in prosecuting the mining and a large expense had been incurred in constructing a shaft to carry on the work just before suit to declare a forfeiture was brought.

On the other hand, the West Virginia Supreme Court has decreed cancellation of a lease for failure of the lessee to conduct operations for a period of two years and three months, where the lease contemplated production on a monthly royalty basis at the end of one year. (*Starn vs. Huffman*, 59 Southeastern Reporter 179.) And the Missouri Supreme Court forfeited a lease for sixteen months' delay. (*Brooks vs. Gaffin*, 90 Southwestern Reporter 808.)

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Lessee Cannot Dispute Lessor's Title—A person who occupied coal lands under a lease and option could not dispute the title of the lessor, nor could a coal company which claimed under an assignment of the lease and option. (*Oregon Supreme Court, Rouse vs. Riverton Coal & Development Co.*, 142 Pacific Reporter 343.)

*Attorney-at-law, St. Paul, Minn.

Discussion By Readers

Method of Working Underlying Coal Seam

Letter No. 1—Referring to the proposition of Mr. Lyman, as described in his inquiry, *COAL AGE*, Aug. 29, p. 357, I had hoped to see this proposition fully discussed by the practical readers of *COAL AGE*, and will venture to express my own opinion in reference to the working of this seam of coal, in the hope of inducing others to do the same. Perhaps no subject is of greater interest to mining men than that relating to the economical and safe mining of coal under difficult conditions.

In the first place, in my opinion, neither the thickness of the seam nor the nature of the strata lying immediately above and below this coal present any features that would recommend the adoption of the pillar-and-stall system of mining. In all pillar systems applied to the mining of coal, one of the greatest difficulties experienced is the question of keeping the roadways open, as the development of the mine progresses. In all pillar systems of mining, the danger of squeeze exists to a greater or less extent, and the extraction of the coal is accompanied or followed by a greater or less settlement of the roof, which is sometimes gradual and gives little trouble, but more often results in breaks and roof falls that hinder and endanger the work and increase the cost of getting out the coal.

Owing to these considerations, in the adoption of the pillar system of mining, it is necessary to take the precaution of driving all roads with a sufficient height or headroom that will provide a good margin of safety. Unless a sufficient allowance be made for head clearance above the top of the loaded car, taking into account the settlement of the roof that is certain to occur, it will frequently be necessary to suspend work at the face temporarily, while lifting bottom or brushing the roof.

In the present inquiry the thickness of the seam is given as $4\frac{1}{2}$ ft.; and it is stated that the roof is composed of soft shale, slate and limestone. These conditions make it almost certain that stringers or crossbars will be required to support the roof. These crossbars or collars will occupy from 6 to 12 in. at the roof, while the track will require 6 in. more at the floor, leaving only about 3 ft. of clear headroom above the rail. The soft floor is also an item that must be considered before adopting any pillar system of mining, as the weight coming on the pillars will have a tendency to heave the bottom.

Taking these considerations into account, I would recommend the adoption of the longwall-retreating system of mining. It is true that, in the adoption of this system, the roads must first be driven to the limit; but, since these are made in the solid coal, they will be more permanent and require the handling of less waste material than would be necessary in any pillar system. The work, generally, will be much safer, the extraction of the coal more complete, and the ventilation of the mine will present fewer difficulties than when mining on the pillar system. The longwall system also insures a larger output

of coal for the same length of roadway, which reduces the cost of maintaining the roads; also, the work of collecting the cars, at the face, is much simplified, because the work is more concentrated. There is generally a greater percentage of lump coal produced in longwall mining; and the roof settlement being more gradual, less damage results on the surface. By the adoption of the retreating longwall plan of mining, there will be less danger of the pillars in the overlying seam breaking through into the workings below, provided suitable attention is given to the stowing of the waste behind the longwall face, as the work proceeds.

No doubt some would prefer the adoption of the pillar system of mining in this case, notwithstanding the existing conditions, had the thickness of the coal been greater, which would then require the handling of less waste material in the rooms. I hope to see this proposition further discussed by men whose experience will be of value to us all.

JAMES DICKSON.

Nanaimo, B. C., Canada.

The Safety Lamp and the Eyesight

Some time since, I remember, the question of the effect of the safety lamp on the eyesight was discussed in *COAL AGE*. Since that time, my eyes have become affected by the use of the safety lamp; and I would like to ask if anyone can tell how long it would probably be before a person so affected would become totally blind and what could be done to prevent such a calamity.

The trouble with my eyes began with an apparent swinging motion of the floor or the ground on which I stood. I next noticed that lights, at about 500 ft. distant, began to revolve when I looked at them. This has grown worse recently, and, now, lights close at hand often seem to revolve as I look at them. This continues until I can't see at all. I can see the light on my safety lamp, however, as well as ever; but when I proceed to put the date of my examination on the coal face, my hands seem to swing around and around. I have been firebossing for seven years continuously. I would very much appreciate some of our readers giving me further information, so that I will know when I ought to quit.

J. MILES KEMP.

Maben, Ala.

[In the discussion of the question of whether the continuous use of the safety lamp, in coal mining, affected the eyesight of miners, *COAL AGE*, Vol. 4, a great number of varying opinions were expressed; but, as stated in review of this discussion, *COAL AGE*, Vol. 4, p. 585; and Vol. 5, p. 135, it has not been shown that healthy eyesight has been impaired from this cause. Men who had used the safety lamp continuously for more than a quarter of a century, testified to having as perfect eyesight as could be expected if they had not used the lamp.—Ed.]

The Reverse or Counter-Current Theory

Letter No. 8—In his recent letter, COAL AGE, Sept. 5, p. 398, Mr. Ashworth seems to infer that there is a collaboration between Mr. Verner and myself with respect to the graphic illustration of Mr. Verner's theory of the initiation and cumulative effects of a coal-dust explosion, which appeared in my letter, COAL AGE, Vol. 5, p. 1059 and was reproduced in the issue of Sept. 5, p. 398. In justice to Mr. Verner, I feel it my duty to state that, so far as I am aware, this diagram never received his sanction.

Believing, with Mr. Ashworth, that an idea or theory can be more clearly and comprehensively conveyed by a diagram when the subject matter will permit, I embodied my idea of this theory in a graphic illustration, trusting that, if my conception was wrong, Mr. Verner or some other authority would point out the error, that myself and others might profit thereby.

In his criticism, Mr. Ashworth remarks:

It is clear, however, that no such reverse current would be produced until the force exerted by the powder or other explosive had expended its energy.

This statement, though slightly indefinite, agrees practically with what I stated, in my explanation, p. 1059, to the effect that a reverse current will *not* take place until the force of the blast "becomes more or less exhausted" or is opposed by an equal or stronger force, through the elasticity of the air compressed. Also, that the reaction between the resulting compression and depression would manifest itself at the point of least resistance, at the floor. If I have correctly interpreted Mr. Ashworth's meaning there is no difference of opinion in this respect.

Again, Mr. Ashworth remarks:

It would seem also that, at the point C in the figure, the air would be in a state of compression instead of a depression or vacuum condition, existing.

I have always regarded the gas and flame of a blown-out shot as analogous to a projectile. If a projectile strikes a nonelastic body, the greatest compression will occur at the point of impact; and, if complete penetration takes place, alternate compression and expansion will result in different parts of the mass. If, however, the body struck be elastic, the compression of the area of impact will result in an expansion of the surface or mass not in the line of impact. Air being elastic may therefore be expected to expand toward the line of impact, thereby creating the vacuum condition at C and along the line of discharge. Mr. Ashworth's method of proving my deduction to be incorrect is not consistent with his own statement, as his diagram, Fig. 2, accepting for the purpose his argument, proves the existence of a vacuum condition along the longwall face, on each side of the shot, in which respect it does not differ from the diagram I submitted.

Mr. Ashworth further observes that, in explosions of this kind with which he has had experience, he has "observed that there was invariably a large cavity or air space in the immediate neighborhood of the blast." I take his meaning to be that such an area is more favorable to a general expansion of the blast, and furnishes besides, a sufficient supply of oxygen for the initiation of the explosion. So far the logic is sound; but, if he in-

tends to say that an explosion will not occur except through the agency of such an area, I fail to grasp the argument. That explosions have occurred where such a condition existed, is no proof that an explosion will not occur where such condition does not exist, if the necessary factors for its occurrence be present; and the reverse current supplies these factors.

Mr. Ashworth's opinion that "when a shot blows out, the heated gases and particles of solid matter are projected into the mine roadway where the blast stirs up the dust" is generally conceded to be correct. But speaking of the initial moment when the fatal blast occurs, he says:

At this initial moment, the atmosphere in the immediate vicinity of the shot is quickly rendered devoid of oxygen, which makes an explosion of the dust and gas at this point impossible.

I regard this statement as a very strong argument in favor of Mr. Verner's theory; but a practical test, as has been suggested, would be to place a barrier across the air course so as to prevent the supplying of sufficient oxygen for the necessary combustion through the agency of the reverse current.

Mr. Ashworth, in concluding his remarks, says there has not been shown "any reverse current other than that due to the cooling of the heated gases, which occurs in what is properly called, the condensation stage, etc." If this be true, then such an explosion would be characterized by only one compression and one expansion. In a recent issue of COAL AGE (Aug. 22, p. 294), there was given a description of an experimental explosion at the British experimental station at Eskmeals. At the mouth of the experimental tube a marker indicated upon a plate the compressions and expansions of the atmosphere, from the moment of the occurrence of the blast to the termination of the explosion, plainly showing that more than one compression and expansion took place.

Mr. Ashworth has not touched upon the cumulative effects of a coal-dust explosion which I believe is one of the principal things the theory seeks to explain. I question whether a practical test of Mr. Verner's theory, by the methods he has suggested, would result in the prevention of an explosion; but that the cumulative effects of such an explosion may be due to such a cause, I see no reason to doubt.

I. C. PARFITT.

Jerome, Penn.

Letter No. 9—I notice, by Mr. Ashworth's letter, COAL AGE, Sept. 5, p. 398, that he rejects the theory that the counter-current set up in a mine entry, immediately following an explosion of gas or dust, becomes a factor in the development and propagation of the explosion throughout the mine.

I want to express my indebtedness to Mr. Parfitt for his detailed explanation, COAL AGE, Vol. 5, p. 1059, of the action of such counter-currents occurring as an incident of the initial explosion at the face of a room or entry. I feel assured that Mr. Ashworth, after he has read Mr. Dean's description of the test at Eskmeals Experimental Station, COAL AGE, Aug. 22, p. 294, will no longer doubt the existence of the counter-current, in dust explosions, and its influence in the initiation and propagation of the resulting mine explosion.

At the present time, I will only briefly review Mr.

Ashworth's criticism of Mr. Parfitt's illustration, which is reproduced as Fig. 1, p. 398. The diagram represents an ideal or suggestion of what may reasonably be assumed to take place when a shot, fired at the face of a chamber or heading, is discharged into an explosive atmosphere of gas or dust. The principal force of the explosion is shown as projected along the roof of the heading, giving rise to a counter-current setting in along the floor at a point marked *F*. Referring to this sketch, Mr. Ashworth states:

It is clear, however, that no such reverse current could be produced until the force exerted by the powder or other explosive had expended its energy.

My own observations and the results at Eskmeals and elsewhere have proved, to my mind, that the reverse current is not delayed until all the energy of the explosive blast has been expended; but that such a current sets in immediately after the explosive force has reached and passed its maximum; or, in other words, as soon as the pressure begins to decline. I am pleased to say that I regard Mr. Parfitt's sketch, in this respect, as fairly representative of true conditions in the mine.

Mr. Ashworth, further, doubts the existence of "a depression or vacuum condition" behind the blast when the shot is fired at the face of a heading, as indicated by *C* in Mr. Parfitt's Fig. 1, and suggests that a shot fired at a gate-end, in a longwall face, might produce such a

condition by drawing the air from the road along the face, after the principle of an injector (Fig. 2, p. 398). I consider that the large space open at the longwall face suggested by Mr. Ashworth would prevent any depression being formed there at the moment the shot is fired.

Permit me to say, in conclusion, that the existence, during every dust explosion, of air inrushes, counter-currents, reverse impulses, or any other name by which these air movements may be known, has been established, by the experiment at Eskmeals, in the most convincing manner. Granting this to be true, the next step, in my opinion, should be the investigation of the function of such a reverse current. In other words, an effort should now be made to show how such currents influence the initiation and propagation of a dust explosion throughout the mine. This is what I have termed the "air factor" in a mine explosion. It is possible, I believe, to carry this investigation to a final conclusion and establish beyond a doubt what this influence may be. When that work has been accomplished at experiment stations, we shall possess more definite information in regard to mine explosions and be able to determine more effective means for their mitigation or prevention.

JOHN VERNER,

Former State Mine Inspector.

(Chariton, Iowa.

Study Course in Coal Mining

BY J. T. BEARD

The Coal Age Pocket Book

Theory of Siphoning—In order to operate a mine siphon successfully it is absolutely necessary to understand the theory of its working, and to know its limitations, and be able to detect the causes of failure when the results obtained are not satisfactory. Aside from the requirements of an air-tight pipe line and the complete or effective submergence of the ends of the pipe and assuming a clean bore, unobstructed by corrosion, sharp bends, globe valves, etc., there are other important considerations that affect and limit the flow of water in a siphon.

1. It is necessary to consider the flow of water from the intake end to the summit (short leg), as independent of the flow from the summit to the discharge end (long leg). The flow in the short leg is caused by the pressure of the atmosphere; that in the long leg is due to gravity.

In the **short leg** the gravity head (h_1) opposes the atmospheric head (H), which gives,

Effective head (short leg), $H - h_1$

In the **long leg**, the atmospheric head (H) opposes the gravity head (h_2), which gives,

Effective head (long leg), $h_2 - H$

2. It is evident, at once, that the gravity head (h_1) or rise in the short leg must always be less than the atmospheric head (H), in order that water shall flow to the summit of the pipe, and, further, as the rise of the pipe approaches the atmospheric head, the effective suction head will be correspondingly less.

The **atmospheric head** varies with the elevation above sea level and is, besides, subject to barometric changes. The average atmospheric head at sea level, expressed in water column, is $14.7 \div 0.434 =$ say 34 ft., which is therefore the theoretical limit to the rise of a siphon, at sea level. Owing to the frictional resistance of the pipe and other obstructions to the flow, the practical limit of rise is much less.

A **practical rule** for calculating approximately the allowable rise or **suction head**, in siphoning or pumping is:

Rule—Approximately, under ordinary conditions, the allowable suction of a pump or siphon in feet, may be taken as nine-tenths of the height of the barometer, in inches.

3. The **flow in the suction end**, under the effective head $H - h_1$, is calculated by equating this effective head with the sum of the friction head and the velocity head expressed in gallons per minute (G); length of suction end in feet (l_1); and diameter of pipe in inches (d_1), which are as follows:

Friction head, $\frac{l_1 G^2}{800 d_1^5}$

Velocity head, $0.0026 \frac{G^2}{d_1^5}$

$$H - h_1 = \frac{l_1 G^2}{800 d_1^5} + 0.0026 \frac{G^2}{d_1^5}$$

Then, solving for G , the flow in the suction end is

$$G = d_1^2 \sqrt{\frac{800 d_1 (H - h_1)}{l_1 + 2.08 d_1}}$$

4. The **flow in the discharge end**, under the effective head $h_2 - H$, is calculated in the same manner as before, by equating this effective head with the sum of the friction and velocity heads and solving for G , which gives

$$G = d_2^2 \sqrt{\frac{800 d_2 (h_2 - H)}{l_2 + 2.08 d_2}}$$

5. The proper **design** of a mine siphon requires that the diameters of the suction and discharge pipes shall be proportioned to their respective lengths and effective heads.

To determine this relation, in practice, whenever the diameter of the pipe in inches, does not exceed its length in hundreds of feet, the velocity head can be ignored with an error that will not exceed one per cent. This eliminates the term 2.08d in the above formulas expressing the flow.

In order that the siphon shall run full continuously, without necessitating the throttling of the discharge, the flow of water to the summit, under the effective suction head must at least equal the flow from the summit, under the effective discharge head. Therefore, equating the expressions for these respective flows, and disregarding the velocity head,

$$\left(\frac{d_2}{d_1}\right)^5 = \frac{H - h_1}{h_2 - H} \times \frac{l_2}{l_1}$$

Or, the relation of the **effective head, diameter and length** of pipe, in the respective suction and discharge arms of a siphon, when the diameter of the pipe in inches does not exceed its length in hundreds of feet, is expressed by the following:

Rule—The fifth power of the diameter of the pipe varies directly as its length and inversely as the effective head. Or, in other words, the fifth power of the diameter ratio is equal to the length ratio multiplied by the inverse ratio of the effective heads.

When the dimensions of the pipe, in each arm of the siphon, respectively, are thus proportioned to the effective heads, which are producing the flow, the pipe will run full throughout its length; and the velocity of the flowing water will be such that there will not be the same tendency for the air contained in the water, to escape and accumulate at the summit of the siphon or pipe line.

6. The use of **air traps and valves** to throttle the flow of the water in the discharge, and thus prevent the siphon emptying itself or "running dry" are unnecessary devices in a properly designed pipe line.

An **air trap** is a chamber attached to the summit of the pipe line, its connection therewith being controlled by a stop cock or small valve that will permit water from the chamber to replace the air that accumulates at that point when the siphon is not properly designed.

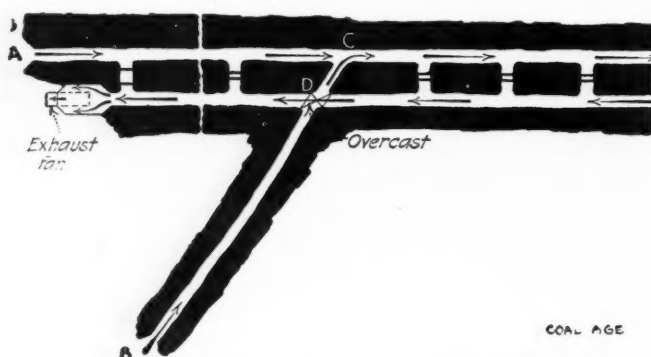
When a valve is required at the discharge end of a siphon a gate valve should be used in place of a globe valve, as the form of construction of the latter presents greater obstruction to the flow of the water. A valve may be required to control the flow in a poorly designed siphon; or whenever the fall in the discharge end of the pipe exceeds the atmospheric head, expressed as water column.

Inquiries of General Interest

Taking a Water-Gage Reading In a Mine

In order to settle an argument in reference to the proper method of taking the water-gage reading in the mine illustrated in the accompanying sketch, will you kindly state which of the methods advanced is the correct one to adopt in this case, that the reading of the gage shall represent correctly the pressure producing the circulation in the mine.

This is a drift mine and, as shown in the sketch, the fan is exhausting the air from a single main-return airway. There are two main-intake roads by which the air enters the mine at *A* and *B*. These air currents unite at *C* to form a single intake current, which traverses the main-intake road and, after passing through the workings, returns to the fan by the main-return airway. The return current is overcast at *D*, before it reaches the fan. The arrows show clearly the course of the air.



SHOWING TWO INTAKE OPENINGS, EXHAUST SYSTEM OF VENTILATION

It is claimed by one party that, in order to obtain a correct water-gage reading in this mine, the gage should be placed on a stopping inby of the point *C*, where the currents join. The other party claims that a correct water-gage reading for the entire mine can only be obtained by placing the gage in such a position that it will indicate the difference of pressure between the main-return airway at the fan and either of the intake roads, close to the entrance of the mine or outby from the point *C*, where the currents join; or, what is practically the same thing, to take the gage reading between the fan drift and the outside air. He urges in support of his claim that "when a fan is exhausting, the barometric pressure of the outside atmosphere forces the air into and through the mine against the partial vacuum created by the action of the fan; and the difference of these pressures is the pressure measured by the water gage in the position he has suggested. We would like to see this question answered in COAL AGE.

U. S. WILSON.

Briceville, Tenn.

In the ventilation of a mine, the air always moves from the point of highest pressure which is the mouth of the

intake, to the point of lowest pressure at the mouth of the return airway. The course between these points does not include the passage through the fan. When the fan is blowing, its location is at the mouth of the intake airway and the point of *highest* pressure, in this case, is in the fan drift, close to the fan; while the lowest pressure is the barometric pressure at the mouth of the return airway. When the fan is exhausting, however, the point of *lowest* pressure is in the fan drift, while the highest pressure is the barometric pressure at the mouth of the intake airway. In either case, the water-gage reading taken on the fan drift will show the difference between the highest and the lowest pressure of the circulation, which will be the correct mine pressure.

The fact that, in this case, there are two intake openings and two intake currents that unite at *C* to form a single intake current, does not alter the situation. Since this fan is exhausting, the barometric pressure of the outside atmosphere, at *A* and *B*, is the highest pressure in the circulation; and the pressure in the fan drift close to the fan is the lowest pressure. The correct position of the water gage when ascertaining the mine pressure is, therefore, on the fan drift close to the fan, but at such a distance from it as to avoid the violent oscillation of the water in the gage that sometimes takes place, owing to the eddying of the current or an unsteady action of the fan.

✱

Adding Air to Reduce Flame Cap

Referring to the answer to an examination question, COAL AGE, Sept. 12, p. 444, it seems to me that the air required (37,300 cu.ft.) is not nearly sufficient to dilute the gas so that no cap will appear on the lamp. The amount of gas in the air current is found to be 946 cu.ft. per min.; but I do not understand why this is divided by 0.02 to obtain the total volume of the return current. Kindly explain.

INQUIRER.

South Brownsville, Penn.

If the 946 cu.ft. of gas is 2 per cent. of the total return current (air and gas) after dilution, 1 per cent. is

$$946 \div 2 = 473 \text{ cu.ft.};$$

and 100 per cent. of the total return current including the air added, is then

$$473 \times 100 = 47,300 \text{ cu.ft. per min.}$$

The same result is obtained by dividing at once by 0.02, as in the answer given Sept. 12, p. 444; thus,

$$946 \div 0.02 = 47,300 \text{ cu.ft. per min.}$$

The original current of air and gas being 10,000 cu.ft. per min., the air added to this current is

$$47,300 - 10,000 = 37,300 \text{ cu.ft. per min.}$$

To prove this result, find 2 per cent. of the total return current, which is the gas present; thus,

$$47,300 \times 0.02 = 946 \text{ cu.ft. per min.}$$

Examination Questions

Wyoming Questions (1912)

(Answered by Request)

Ques.—What is afterdamp and why is it dangerous to life?

Ans.—Afterdamp is a variable mixture of the gaseous products of an explosion of gas or dust, generally mixed with more or less air. The composition of afterdamp is very variable, depending on the character of the gases burned and the conditions attending the explosion, in respect to the quantity of air available for the combustion of the gases. As the proportion of air (oxygen) available for combustion is increased, the percentage of carbon dioxide (CO_2) formed is increased, while the percentage of carbon monoxide (CO) formed by the explosion is decreased, as shown by the following:

Gas to air, 1 : 4.5; 10 per cent. of carbon burns to CO_2
90 per cent. of carbon burns to CO

Gas to air, 1 : 5; 13 per cent. of carbon burns to CO_2
87 per cent. of carbon burns to CO

Gas to air, 1 : 6; 20 per cent. of carbon burns to CO_2
80 per cent. of carbon burns to CO

Gas to air, 1 : 9.57; all of the carbon is converted into CO_2

Afterdamp is dangerous to life for two reasons; namely, the available oxygen is insufficient for the support of life; the gases composing the mixture are either poisonous or suffocating when breathed into the lungs.

Ques.—Explain the meaning of the terms, *ventilating pressure*, *water gage* and *resistance of air*, as used in mine ventilation.

Ans.—The ventilating pressure is the pressure producing ventilation. This should be the entire pressure exerted on the sectional area of the airway, which is the equivalent of the resistance to be overcome in passing the air through the airway. The term "ventilating pressure," however, is quite generally used for the unit pressure or pressure per square foot of sectional area.

The term, *water gage*, refers to the inches of water column supported by the air pressure producing the circulation. The water gage is, therefore, the measure of the difference of pressure between the intake and the return airways, in any given circulation of air. One inch of water gage corresponds to a pressure of 5.2 lb. per sq.ft.

The *resistance* of an airway is the force developed in opposition to the passage of air through the same and is equal to the pressure exerted on the total sectional area of the airway to produce the circulation. The resistance of an airway is expressed in pounds. It is caused by the friction of the air rubbing on the sides, top and bottom of the airway and the obstruction offered by timbers and other abutting surfaces that impede the flow of the air.

Ques.—(a) How is pressure measured in a mine airway? (b) Explain the constant, 5.2, used in connection with water-gage calculations.

Ans.—(a) The pressure producing circulation in a mine or airway is measured by means of the water gage, which is a U-shaped glass tube containing water in the bend of the tube. Both ends of the tube are open, one of

these being connected with the intake while the other is open to the return airway. The pressure on the intake airway always being the greater, the water in this arm of the tube is depressed, while that in the other arm rises an equal amount. The difference between the two water levels of the gage is the water column that measures the difference of pressure between the two airways or the pressure producing the circulation. Since each inch of water gage corresponds to a pressure of 5.2 lb. per sq.ft., the water-gage reading multiplied by 5.2 will give the unit of ventilating pressure, in pounds per square foot.

(b) The weight of a cubic foot of water is practically 62.5 lb.; and the weight of water 1 in. deep spread over an area of 1 sq.ft. is, therefore, $62.5 \div 12 = 5.2$ lb. Since water always rises to the same level, this weight of water, in pounds, spread over 1 sq.ft. of area is equal to the pressure, in pounds per square foot, corresponding to 1 in. of water gage.

Ques.—If the length of an airway is increased four times, what is the effect on the friction of the air current?

Ans.—The friction will be increased in the same ratio as the length of the airway; or, in this case, the friction will be increased four times.

Ques.—If the velocity of the air current be increased four times, what will be the effect on the friction of the air passing through the airways?

Ans.—The friction increases as the square of the velocity of the air current. If the velocity be increased four times, the friction will be increased $4^2 = 16$ times the original friction.

Ques.—If an explosion should occur in the safety lamp when testing for gas, or the lamp should suddenly fill with flame, what would you do to insure your own safety?

Ans.—It is important, in either case, to make no quick movement, as that would increase the danger. An explosion within the lamp chimney indicates that the air entering the lamp approaches closely to the lower explosive limit. Owing to the presence of more or less burnt air within the lamp chimney, which reduces the explosive condition within the lamp, the air surrounding the lamp may at the same time be highly explosive. Under the observed conditions stated here, a quick movement of the lamp, by assisting the circulation, might cause a sharp explosion within the chimney that would pass the flame through the gauze and ignite the gas outside the lamp.

The flaming of the lamp indicates a similar condition within and surrounding the gauze chimney, but to a lesser degree. A quick motion of the lamp downward causes a greater upward pressure within the chimney and tends to transmit the flame through the upper portion of the gauze. In the flaming of the lamp, the moment of greatest danger is when the lamp is being removed from the gas into fresher air below. The entrance of the fresh air into the combustion chamber of the lamp increases momentarily the explosive condition of the gas-charged air within the chimney, which might cause an explosion that would transmit the flame through the gauze.

Coal and Coke News

Washington, D. C.

The Senate Committee on Public Lands has reported the bill to provide for leasing coal lands in Alaska, which passed the House of Representatives on Sept. 5, in an entirely new form. This provides for authorizing the Secretary of the Interior to survey the lands in the territory of Alaska, just as was done in the house bill. In Sect. 2 of the measure, 5120 acres of coal-bearing land in the Bering River field and 7680 in the Matanuska field are reserved to the United States for the purpose of mining for government use. Then the following draft of Sect. 3 is inserted with reference to the conditions under which the unreserved lands are to be taken up:

That the unreserved coal lands shall be divided by the Secretary of the Interior into leasing blocks or tracts of 40 acres each, or multiples thereof, and in such form as in the opinion of the Secretary will permit the most economical mining of the coal in such blocks, but in no case exceeding 2560 acres in any one leasing block or tract; and thereafter, subject to any prior valid existing rights, which said rights may be perfected under the laws in force at the time the same were initiated.

The Secretary shall offer such blocks or tracts and the coal, lignite and associated minerals therein for leasing, and shall award leases thereof through advertisement, competitive bidding, or such other methods as he may by general regulations adopt, to any person above the age of 21 years who is a citizen of the United States, or to any association of such persons, or to any corporation organized under the laws of the United States or of any state or territory thereof.

Provided, that no more than one of said blocks shall be included in any lease.

And provided further, that no railroad or common carrier shall be permitted to take or acquire through lease or permit under this act, any coal or coal lands in excess of such area or quantity as may be required and used solely for its own use, and such limitation of use shall be expressed in all leases or permits issued to railroads or common carriers hereunder.

And provided further, that any person, association or corporation qualified to become a lessee under this act and owning any pending claim under the public-land laws to any coal lands in Alaska may, within one year from the passage of this act, enter into an arrangement with the Secretary of the Interior by which such claim shall be fully relinquished to the United States; and if in the judgment of the Secretary of the Interior the circumstances connected with such claim justify so doing, the moneys paid by the claimant or claimants to the United States on account of such claim may, by direction of the Secretary of the Interior, be returned and paid over to such person, association or corporation as a consideration for such relinquishment, or in lieu of such repayment, the Secretary of the Interior may execute and deliver to said person, association or corporation, in preference to any other lessee, a lease under this act of the land so claimed or any part thereof within the limitations of area and location fixed by Sect. 2 hereof, and the said moneys may be credited upon the royalties to become due under such lease; Provided, that if the land so claimed be within a reservation made in pursuance of Sect. 7 of this act, other coal lands in Alaska of substantially equal value may be substituted in said lease for the lands so relinquished.

The later sections relate to details concerning the purchase or acquirement of mining rights by individuals. Sect. 9 reads as follows:

That for the privilege of mining and extracting and disposing of the coal in the lands covered by his lease, the lessee shall pay to the United States such royalties as may be specified in the lease, which shall not be less than 2c. nor more than 5c. per ton, due and payable at the end of each month succeeding that of the shipment of the coal from the mine, and an annual rental, payable at the beginning of each year, on the lands covered by such lease, at the rate of 25c. per acre for the first year thereafter, 50c. per acre for the second, third, fourth and fifth years, and \$1 per acre for each and every year thereafter during the continuance of the lease, except that such rental for any year shall be credited against the royalties as they accrue for that year. Leases may be for periods of not more than 50 years each, subject to renewal, on such terms and conditions as may be authorized by law at the time of such renewal.

Five Per Cent. Rate Case to Be Reopened

Contrary to expectations, the Interstate Commerce Commission has reopened the 5 per cent. rate case and will again hold hearings regarding it. There is no official assurance on the subject, but it is pretty generally understood that the commission has no intention of changing its attitude on the question of rates on heavy products, of which coal is a conspicuous example.

From all appearances, whatever the commission chooses to do will be done with due regard to the necessities of the coal industry, as already ascertained, and of others which are in a like position. There was no industry, it is learned,

which made a stronger demonstration of its position during the hearing before the commission when the original 5 per cent. case was being heard than the coal industry.

HARRISBURG, PENN.

There is wide interest in the argument arranged for Sept. 25, on the "Mine foremen's certificate" case, which will be heard by Judge Kunkle, in this city.

The United Mine Workers are anxious to prevent the issuance of certificates to the successful candidates, who they allege have not had the requisite experience of five years in actual work of cutting coal at the face. The law requires that each applicant shall have had five years' experience as a miner, but the attorney-general recently applied an interpretation that "miner" means anyone engaged about the mines.

The United Mine Workers take a different view of the matter from that of the chief of the Department of Mines, who is abiding by the interpretation of the attorney-general. They began proceedings in the name of James Mathews, president of the Schuylkill district, to stop the issuance of certificates to the large number of men who passed the recent examination when the bars were let down. As a result, the certificates of the anthracite region have not been issued. The candidates who passed the examination have now retained ex-Judge A. L. Shay, who has applied for a mandamus on the chief of the Department of Mines, Hon. James E. Roderick, to compel the issuance of the certificates which were awarded by the examining boards.

Judge Shay claims that the court cannot go behind the returns of the examining board unless fraud is alleged, and that the board is sole judge of the qualifications of the candidates.

He quotes a decision of the Schuylkill County court in the case of Thomas Reese, who was refused a certificate for mine inspector. In that case, the court said it could not substitute its own discretion for that of the board and refused any relief to Reese.

The argument on Sept. 25, therefore, may not be on the merits of the question, but whether the courts have jurisdiction under the circumstances surrounding this case. The whole anthracite region is keenly interested in the matter. The miners have engaged as counsel, James J. Moran and ex-Congressman J. B. Reilly, who will argue that the safety of many thousands of men depends on having efficient and experienced foremen. Deputy Attorney-General J. E. E. Cunningham will represent the Department of Mines.

A Medal Is Awarded

The Bliss breaker, owned and operated by the Delaware, Lackawanna & Western R.R. Co., was struck by lightning on July 27, 1914. The bolt tore off a portion of the roof and set the building afire, the employees running panic-stricken from the breaker to a place of safety. John Zabigolski, who is employed as a slate boss, instead of following his fellow-employees, picked up a hose and turned a stream of water on the fire, which resulted in saving the big building.

The company has just rewarded Mr. Zabigolski for his bravery by presenting him with a beautiful gold medal as an award of merit. The medal is engraved as follows:

SAFETY FIRST
AWARD OF MERIT
JOHN ZABIGOLSKI
JULY 27, 1914
MINING DEPT.

Mr. Zabigolski may well feel proud of the honor, since it is the first medal presented as a token of merit by the Lackawanna R.R. mining department in this region to any employee for an act of heroism.

PENNSYLVANIA

Anthracite

Girardville—Anthony Faran was killed and John Regan was seriously injured and four others were entombed for several hours when the timber in an old gangway collapsed under a fall of coal at Packer Colliery No. 5 of the Lehigh Valley Coal Co., on Sept. 17. A rescuing force reached the entombed men after three hours of perilous labor.

Ashley—Because it is alleged that three patchers employed in Maxwell Colliery, Lehigh & Wilkes-Barre Coal Co. had not been given an increase in pay which they claim was promised

them, and which they say is due them under the terms of the last agreement, a strike was called on Sept. 18, and the entire colliery was shut down.

Plymouth—A button strike was called at the Lance colliery, Lehigh & Wilkes-Barre Coal Co., at Plymouth. A number of men have refused to join the union and the others refuse to work with them.

The strike at the Dorrance colliery of the Lehigh Valley Coal Co., which grew out of the company's new regulation regarding car topping is still unsettled.

Wanamie—Officials of the Lehigh & Wilkes-Barre Coal Co. are considering the project of erecting a new breaker at No. 18 colliery. It is said that plans are to be made for a new all steel structure some distance from the present breaker. Electricity for power and modern machinery for coal preparation are to be used.

Mt. Carmel—Two men were killed and one fatally injured in the Midvalley colliery when a trip of cars upon which they were riding struck a mining locomotive. In order to avoid a long walk to reach home, 11 men and boys disregarded the rules and warnings of the company. The trip started at high speed when the cars reached a curve on the slope and crashed into a locomotive drawing a trip of loaded cars.

Hazleton—The anthracite mines in the Lehigh coal fields, on Sept. 14, started on their second week of steady time, which is to be continued indefinitely. The Lehigh Valley R.R. is getting ready for heavy fall coal business. Motive power is being repaired and cars are being gathered from all points to handle the traffic. With the mines in steady operation and local industries going nearly full blast the Hazleton region is not suffering depression. The European war has not yet caused any suspension of work at local mills; but as Hazleton and the surrounding towns depend mainly on the anthracite industry a good winter is ahead.

Bituminous

New Salem—The main business block of this place, an H. C. Frick Coke Co. town of about 2000 population, was destroyed by fire on Sept. 17. The damage is estimated at \$40,000. A school building erected at a cost of \$30,000 was burned several months ago. It is rumored that these fires were of incendiary origin.

Jerome—The probability of Sunday shifts to keep up with the great demand for its product was announced on Sept. 15, by the Jenner-Quemahoning Coal Co. Orders for coal from this company's mines are said to be piling up faster than the company can fill them at the present rate of mining, and long trains are being sent both east and west, loaded with coal. The condition is considered extraordinary by operators, as there is a noticeable slump in business in most of the workings in the vicinity.

Milford—The 700-acre tract that was optioned for the Hinchman Brothers of Mount Pleasant may be sold to Cambria County capitalists. The field under option includes coal underlying the farms of G. J. Hayes, J. M. Critchfield, A. J. Newman, Walker Brothers and F. F. Welmer. It has been learned that the Cambria County operators are favorably impressed with the quality of the coal and will likely purchase the tract together with several acres of surface upon which to build a plant.

Mines on all these farms have been opened and have been supplying local trade for several years. It is believed that the equipment for operating the tract will be placed on the Hayes farm, which is more accessible to the Somerset & Cambria branch of the Baltimore & Ohio and that the mine opening at this particular point has been better constructed. The deal for the 700 acres will likely be closed before the end of September.

Pittsburgh—The plans for the new buildings of the U. S. Bureau of Mines located in Pittsburgh have been completed and are now in Washington awaiting the approval of the government architect. It is expected that bids for the construction of these buildings will be invited and contracts awarded not later than Oct. 15.

Connellsville—The Connellsville coke region is now producing approximately 250,000 tons weekly, which is a new low record for the year. The coal market in the Pittsburgh district on the other hand, has been slightly more active as the result of increased demand for domestic purposes.

WEST VIRGINIA

Charleston—It is announced by the mine workers' organization that all contracts which expired in the Kanawha district in March have now been renewed and that the entire district is now at work without friction. Contracts are also being sought with the Milburn Coal Co. and the Solvay Coal Co., both of which have begun operations on Paint Creek.

The miners working these operations have been working on a temporary agreement, but it is believed that there will be no difficulty in securing the consent of the two companies to operate under the general wage agreement.

Fatality records in the department of mines show that during the month of August, 32 men lost their lives in West Virginia coal operations. Chief Inspector Earl A. Henry is calling the attention of both miners and operators throughout the state to the number of accidents and deaths due to riding on loaded trips, 10 of the 32 fatalities during the month arising from this cause. Eleven more are classified as due to carelessness. A further classification shows that 15 deaths were due to falls of coal and slate, 10 to mine cars, motors and the like, 6 to electrocution, and one to machinery.

Welch—Complaint was recently brought before Justice of the Peace, A. T. Hufford, charging that William Concoski, of Superior No. 1 Mine, a Russian, was carrying matches and smoking under ground. The mine is worked on locked safety lamps and permissible electric lights. He was fined \$100 and costs. This is the first case of its kind, and should be a lesson to others violating Sec. 18 of the Mining Law.

TENNESSEE

Chattanooga—Coal shipments are to begin soon from the developments the Castle Rock Coal & Coke Co. The capital of the company is provided and it is opening up the famous Coal City seam on the side of the mountain nearest Whiteside, Tenn., on the Nashville, Chattanooga & St. Louis R.R.

KENTUCKY

Whitesburg—Last week was a record breaker in point of coal shipments from the Consolidation Coal Co.'s plants in the Jenkins-McRoberts-Burdine fields, though definite figures are not available. The company is planning continued increases in its output.

Louisville—Of the 866,980 workers in Kentucky engaged in gainful occupations, 21,100 or 2.4 per cent. of the total are miners, according to the detailed report of the census bureau for 1910. Of the miners, all but 9 were males, while of the total number of miners 18,310 were coal mine operatives.

Hazard—The Hazard Town Coal Co. is opening a large mine in the No. 4 seam of coal immediately west of Hazard, on the North Fork of the Kentucky River. The main line of the Lexington & Eastern division of the Louisville & Nashville R.R. is on the opposite side of the stream. The tippie will be built beside the railroad and the coal carried from the mine to it across the river in an aerial tramway.

Benham—The Wisconsin Steel Co. is now shipping a larger coal tonnage than at any time in the history of its operations in the Cumberland River field. At present the Wasioto & Black Mountain R.R., a branch of the L. & N. is taxed to the limit to handle the unusually large coal tonnage going out from the different plants. A large increase was made also last week in the working force of the company, while increases are billed to take place from time to time within the next two or three weeks.

OHIO

Columbus—The mine rescue car which was purchased several months ago by the Ohio department of mines has proven its worth. It has shown that the investment of \$10,000 for the car has been a piece of wisdom and that it is one of the genuine assets of the department of mines. Upon two occasions the car and its equipment have been called upon and in both cases it has done all that was claimed for it. The first occasion was a fire in the mines of the Superior Collieries Co. at Wellston, where fire from the tippie was communicated to the interior workings. The car was called and with the aid of the equipment the fire was extinguished in three days. The second occasion was the opening of Mine No. 301 of the Sunday Creek Co. at Congo.

INDIANA

Indianapolis—The local inspector of weights and measures has ordered that coal in baskets must be sold by weight, 80 lb. of soft coal and 40 of coke to the bushel. A certificate of weight must accompany delivery.

ILLINOIS

Belleville—The annual report of the County Mine Inspector for St. Clair County gives a total tonnage of 5,117,002 tons of coal produced for the year. The 54 shipping mines in the County shipped 4,900,489 tons, and the local mines, numbering 17, shipped 107,514 tons. There are 160 mining machines, 27 locomotives and 4313 miners employed, with 425 men at miscellaneous labor. The shipping mines worked on an average of 145 days throughout the year, and the local mines worked 213 days.

Owners of 45 mines in the Belleville district have received letters from Adam Hoffman, Jr., of St. Louis, requesting that the present option for the purchase of these operations be extended for a period of 90 days. Hoffman who has been promoting a \$15,000,000 deal had hoped to raise the capital in France. This plan has fallen through for obvious reasons.

Pana—The men of the Peabody Coal Co. recently went on strike because of the alleged refusal of the company to recognize the pit committee and the district president.

East St. Louis—It is rumored that the Prairie mine, owned by the Aid Coal Co. of St. Louis, is in such a condition that it will likely be abandoned on account of the excessive squeezes that have created doubt as to the likelihood of ever being able to operate the mine at a profit again. This is one of the largest and best mines in St. Clair County, but it has not been operated since early last spring.

Johnston City—The work of developing the property of the Cambria Coal Co., north of here, continues, and an enormous pile of coal, containing several thousand tons, has been taken out and heaped up waiting for the railroad extension to be built into the property. It is understood that the temporary top works will remain until next spring, when a steel tippie and up-to-date head gear will be erected.

Marion—Many of the mines in Williamson and Franklin Counties are able to run only about two or three days a week, on account of the congested condition of their storage tracks, and all sidings on the railroad, with steam coal. Some mines have over a hundred cars of the smaller sizes that they are unable to move at any price. At Johnston City one mine is dumping all of its screenings on a lot adjacent to the mine.

MISSOURI

Richmond—Perry Rice, of Richmond, has leased the Vibbard mine which has not been worked for several years; it is said to have a vein of about 27 in. at a depth of 400 ft. Mr. Rice is reported to be making plans to reopen the old shaft and sink another. The Santa Fe will build a spur to the mine.

UTAH

Eureka—A cave-in occurred recently in the 1600 ft. level of the Continental mine burying 12 mine workers. It is believed that all of these were crushed immediately.

FOREIGN NEWS

Cardiff, Wales—Miners producing the coal for the English navy have shown their loyalty in a manner highly gratifying to the Admiralty. In the face of attempts on the part of labor leaders to take advantage of the present situation for the enforcement of demands upon the Admiralty, the Welch miners have waived all holidays and are working Sundays whenever it is necessary to keep the navy supplied with coal. Union leaders asserted that it was not necessary for the men to surrender their holidays, but the latter disregarded their ruling.

PERSONALS

W. O. Stillwagon, of Mount Pleasant, Penn., is about to retire from the employ of the H. C. Frick Coke Co., after 33 years of service.

R. B. Waddell, formerly connected with the Commercial Coal Co., of Detroit, has accepted a position with the Colonial Coal & Supply Co., of Columbus, and will cover Northern Ohio.

S. A. Bramlette has been appointed special commissioner for the operators in District 25, to assist in digging out of work accumulated during the recent long conferences over Southwestern and district agreements.

H. L. Warner, general manager of the Victoria Coal Co., has completed a thorough inspection of the mines of the company. D. C. Hitt, sales manager of the company, accompanied by Fred C. McConnell, recently visited the mines of the East Kentucky Coal Co., at Torchlight, Ky.

J. M. Roan, chief mine inspector of Ohio, is receiving subscriptions in the form of money and clothing for the benefit of destitute children and women among the miners' families of eastern Ohio. In many instances the children have been unable to attend school because of lack of clothing.

W. L. Carter, until recently general manager of the Bessemer Coal, Iron & Land Co., of Birmingham, Ala., and since engaged in special work, is now general manager of the Himyar Coal Corporation, at Himyar, Ky. This firm is just completing the installation of a new plant including electric hoists and cutters, reinforced concrete tipples, loading booms, etc.

R. A. Colter, secretary and treasurer of the C. G. Blake Co., of Cincinnati, and of the Waldensia Coal & Coke Co., in his capacity as vice-president of the Cincinnati Chamber of Commerce represented that body at the centennial celebration of the city of Covington, Ky., held recently, appearing formally at an elaborate banquet at which prominent local and state officials were present, and addressing the guests on behalf of Cincinnati.

CONSTRUCTION NEWS

Coshocton, Ohio—The Ohio Cannel Coal Co. expects to open its 5-ft. bed of coal underlying 1200 acres in Bedford Township near Coshocton within the next few weeks.

Providence, Ky.—The Providence Coal Co. is constructing what will be the largest retail store in Webster County for its commissary department. The building is to be of brick, 36x90 ft., with a full basement.

Benz Creek, Penn.—W. H. Hughes & Co. have installed at their No. 1 Slope Benz Creek, Cambria County, Penn., the largest electric hoist in that region. This hoist is driven by a Westinghouse continuously rated 400-hp. alternating current motor.

Williamson, W. Va.—Contracts for the construction of two bridges across Tug River and two miles of railroad up Blackberry Creek have been awarded by the Norfolk and Western Ry., and the construction of this road will open up one of the greatest coal fields in eastern Kentucky.

St. Louis, Mo.—Actual work has been begun on the one-story brick building in the 600 block of Catalan St., to cost \$25,000, which will contain the first battery of Koppers by-product coke ovens, for the Laclede Gas Light Co. The entire plant, when completed, next July, will have cost \$750,000.

Winchester, Ky.—It is stated that the Consolidation Coal Co., which has been considering driving a tunnel through the mountains that separate McRoberts from Jenkins has ascertained that the opening will be run through 9 ft. of coal and that a sufficient quantity can be thus secured to pay for the work of excavation.

Hazard, Ky.—The Ashless Coal Co. is completing a bridge across the Kentucky River to reach the main line of the Louisville & Nashville R.R. This will follow the completion of a short, three-mile branch road in order to tap an extensive coal field on Davidson's Creek. The company expects to be shipping coal out from its plant within 30 days. There is unusual industrial activity around the Hazard and Perry County coal field.

Lansford, Penn.—The Lehigh Coal & Navigation Co., is now installing at its No. 11 shaft the largest alternating-current equipment used in the anthracite region. The hoist is operated by means of a Westinghouse motor and liquid controller, rated at 750 hp. continuously. The weight of coal, car and cage combined is 28,000 lb. Forty trips per hour are made from the 500-ft. level and 60 trips per hour from the 266-ft. level. The rope speed being 1300 ft. per minute.

NEW INCORPORATIONS

Chattanooga, Tenn.—The Castlebroom Coal & Iron Co., with a capital of \$25,000, has been organized here.

Jenny Lind, Ark.—The Moma Coal Co. has been incorporated here with a capital stock of \$3000, by Joseph Moma, J. L. Henson, Max Richardson and others.

Earlington, Ky.—The Atpontley Coal Co. has announced through its president, James E. Rash, and its secretary, Paul M. Moore, that it is winding up its business in order to dissolve.

Williamsburg, Ky.—The Letz-Jellico Coal Co. announces that its business is being closed up and that the corporation will be dissolved. J. W. Latham is president and J. Robert Zimmerman is secretary.

New Albany, Ind.—The Edward J. Hackett Coal Co. has been incorporated here, with \$20,000 capital stock, for mining purposes. The directors are Edward J. Hackett, John W. Whedon and S. M. Lawrence.

Charleston, W. Va.—The Hardy Coal Co. of Mullins has been organized with a capital of \$100,000. The chief works will be in Parkers Ridge district of Wyoming County. The incorporators are J. C. Sullivan, H. W. Hubbard, J. A. Wood, C. A. Mead, Edward Cox and Frank A. Prince.

Frankfort, Ky.—Articles of incorporation of the Mountain Central Railway Co., which projects a 12½-mile line to run from Campton Junction, Carter County, to Campton, Wolfe County, have been filed with the secretary of state. The company has \$25,000 capital and among the incorporators is the Day Lumber & Coal Co., of Clay City, where headquarters will be located. A large coal and timber area will be opened.

INDUSTRIAL NEWS

Chattanooga, Tenn.—The Continental Coal Corporation recently received a cablegram from Brazilian interests asking quotations on 150,000 tons of coal to be delivered at Charleston, S. C.

Cincinnati, Ohio—It is reliably reported that an order from Brazil for 200,000 tons of coal for immediate shipment, presumably for use by war vessels belonging to the Triple Alliance, has been turned down by local companies operating in the West Virginia fields.

Des Moines, Iowa—Matthew Holmes, administrator of the estate of the late John Holmes, asked damages to the amount of \$20,000 against the Bloomfield Coal Co. in the district court. John Holmes was killed by a fall of slate in the defendant's mine, and negligence is charged.

Johnstown, Penn.—J. H. Salisbury, of Punxsutawney, and John Harrington, of Horatio, have purchased the Liston mine at Listonburg, Somerset County. Forty men will be employed from the outset with both purchasers taking an active part in the operation of the property.

Washington, D. C.—The people of Alaska may be cut off entirely from their coal supply according to Senator Walsh of Montana. He states that practically the entire supply for Alaska comes from British Columbia and that this province is considering placing an embargo on the exportation of coal owing to European hostilities.

Connellsville, Penn.—According to the report of the State Geological Survey, the total value of the mineral production of Fayette County in 1913, excluding the natural gas, was \$38,906,843. This total does not include the value of the coke manufactured, since this was made from coal, the value of which is included in the total given.

Washington, D. C.—Aiming to expand the coal trade with South America during the emergency resulting from war in Europe, the Bureau of Mines recently began the distribution of a bulletin among consumers in Latin American republics describing the coals of the United States best available for export. These bulletins are printed in Spanish, Portuguese and English.

Scottsdale, Penn.—There has been recently considerable inquiry about the completion of the model coal and coke plant at the H. C. Frick Coke Co.'s Engineering Building. All visitors are welcome to view this model before it is sent to the Panama-Pacific Exposition. This model stands 26 ft. long and 16 ft. wide, and will be on exhibition from 3 to 5 o'clock in the afternoon, and from 7 to 9 in the evening.

Birmingham, Ala.—The Alabama Great Southern Ry. has just equipped all of its engines operating in the Birmingham limits with smoke consumers, in order to meet the smoke requirements. The Southern Ry. is also equipping all of its engines with the apparatus. Several methods of firing were tried in order to reduce the smoke, but without satisfactory results. A jet of steam emitted into the smoke has the effect of precipitating the dust, sending the smoke out in a white cloud.

Chicago, Ill.—The Gun-Crete Co., of Chicago, has purchased all the rights, titles, contracts, and interests in the Cement Gun Construction Co., and has also taken over the Construction Department of the General Cement Gun Co. This enlarges the scope of the business greatly. The combined business will hereafter be conducted under the firm name of the Cement Gun Construction Co. with offices at 914 South Michigan Avenue, Chicago.

Charleston, W. Va.—The Knight Couch Coal Co. recently filed suit in equity in the Kanawha County Circuit Court

against the Sunday Creek Co. for \$50,000 damages for alleged injuries done to the plaintiff company's mine at Riverside and the recovery of insurance alleged to be due for the houses belonging to the company which were destroyed by fire. The plaintiff leased the property to the defendant and claims that improper mining methods damaged the holdings to the extent of the amount of the judgment asked.

Connellsville, Penn.—Blast furnace operations in the East are on a much reduced scale, and are being still further curtailed. Three stacks most of the production of which has been of the merchant class have been blown out recently. These include Warwick, of Pottstown, Penn., Leesport, of Leesport, Penn., and Musconetcong at Musconetcong, N. J. The latter has been operated on foundry iron for the Singer Manufacturing Co. In Virginia, one active Low Moor furnace is going out leaving but four stacks now in blast.

Pittsburgh, Penn.—English buyers of Pittsburgh products are in some cases closing contracts for the delivery of steel in lighter finished forms. Pittsburgh manufacturers have recently received inquiries and some orders for wire rods of which several thousand tons have already been sold for shipment abroad. Pittsburgh coal men are considering inquiries for fuel from both South America and Europe, but thus far, business actually closed was drawn to eastern mines, which gained the benefit of a lower freight rate to the seaboard.

New York, N. Y.—The commission representing the Italian government that has been negotiating for coal for the Italian navy is reported to have closed a contract for 100,000 tons for prompt shipment, and is still in the market for a large tonnage for future delivery. Coal sales have also recently been made by local firms amounting to about 72,000 tons for export to Greece. Twenty steamships were cleared from Baltimore recently carrying about 100,000 tons, half of which is destined for Brazil, the balance of the shipment being for Mediterranean ports for Greece and one or two cargoes for Norway.

Montgomery, Ala.—The State Railroad Commission has been in session for some time hearing the proposed increases in the coal freight rates, and continued the hearing until this week. After over-ruling the petition of the contestants who believed the time was not ripe for a trial, the Commission refused to continue the case and immediately began the trial. A decision will determine whether or not railroads operating in the Gadsden-Anniston-Talladega district will be allowed to withdraw special manufacturers rates on coal from the Birmingham district, which rates have been allowed for several years.

Washington, D. C.—There seems to be no question but that West Virginia can dispose of her coal in the foreign markets. The Norwegian steamship "Ranvik" and the Greek steamer "Laertes" left Newport News within the past few days with over 14,000 tons of coal for River Plate ports. On Sept. 17, the British steamer "Glenartney" was awaiting cargo for Buenos Aires, the Norwegian steamer "Mathilde" had sailed with a cargo of 3058 tons for Guantanamo, Cuba, and three Italian steamers arrived from ports in the Mediterranean to load for Naples and Genoa. The question which appears to worry coal men at the present time is the permanency of this market.

Connellsville, Penn.—It is stated that during the year 1912, there were imported into Greece 482,768 short tons of coal of which Great Britain supplied 364,996 tons, Germany, 116,035 tons, the rest coming from Turkey, Belgium, and the Netherlands. The total imports for 1911 were 639,822 short tons, while the estimated figures for 1913 show a rapid recovery from the previous year. The imports into the ports of Piræus for the last twelve months being 665,000 tons including steam and gas coal, etc. The coaling stations in the islands of Zea and Syra received 140,000 tons, most of which was later transferred to ships calling for coal.

Cincinnati, Ohio—The receivers of the Cincinnati, Hamilton & Dayton R.R. have formally filed application in the United States District Court for permission to issue receivers' certificates to the amount of \$2,942,250, for the purpose of providing new rolling stock which is declared to be necessary for the proper operation of the road. It is declared in the petition that the present equipment of the road is neither sufficient nor up to the standard. The following new equipment is to be purchased: Five passenger locomotives, 30 freight locomotives, 1000 box cars, 1000 hopper cars, 12 steel passenger coaches, 8 steel combination passenger and baggage coaches, 4 steel combination baggage and mail cars, 5 steel baggage cars, 1 dining car, 1 steam crane, 1 steam locomotive crane and 105 cabooses. All of the equipment except the cabooses, which can be constructed in the company's shops, will have to be purchased, and bids have been received covering it, upon which the amount indicated is based.

Coal Trade Reviews

General Review

Heavy demand for anthracite continues unabated. Bituminous slows down still further and the outlook is now most discouraging. Lake shipments for the season show a big loss. Middle Western steam fuels given away for freight charges.

The anthracite trade is still marked by a steady, persistent call that presages a heavy business this fall and winter. The individuals are offering occasional concessions where some of the slow sizes have accumulated but as a rule full circular prices prevail. In the Lake trade the situation is rather mixed; some shippers claim they have sufficient stocks while others are eagerly taking all they can get. The heavy demand in other directions has absorbed so much coal that the Lake trade has readily taken up the balance.

It is becoming increasingly difficult to maintain prices in the Eastern bituminous trade. Some of the important distributing centers are more or less congested and the markets are steadily narrowing down. Shipments in the export trade are only fair and should there be further recessions along this line it will severely test the resisting powers of the market since these are an important factor in maintaining the present level. A most determined effort will be necessary to avoid a heavy slump in all directions. Rumors are current that shipments on some of the foreign contracts are already about finished.

The opening up of some domestic buying in the Pittsburgh district has been the only bright spot in an otherwise uniformly dull situation. Both railroad and manufacturing demand is light while advance estimates of the Lake shipping to the close of the season place the tonnage at one third less than last year; this latter has been a particularly discouraging proposition with the operators. The attitude of the railroads in refusing to buy beyond their immediate requirements has also proved a depressing factor. Should the rumors of a proposed moratorium in Canada develop into a reality this will tend to complicate negotiations and make the American operators even more cautious.

The heaviness in the Ohio steam market has reached a point bordering on demoralization and the depressing effects are spreading to the domestic branch as well. Production is somewhat reduced as a result of the adverse conditions which are considered by some as the worst in years. The Lake trade is the only encouraging aspect in the Ohio trade; a moderate season-end rush has developed which has created some activity in this department. As a rule the arrivals are in excess of requirements.

Local business in the Southern market is at more or less of a standstill; some small shipments have been made to foreign markets but no important tonnages have so far been reported.

The wide difference between the steam and domestic grades in the Middle West has been further accentuated. The shortage of high-grade domestic fuels created a stampede in that market, culminating in a spectacular advance in quotations. On the other hand operators are in some instances giving the steam fuels away for the cost of the freight or making arrangements to be supplied with side-dump hopper-bottom cars so that the coal can be dumped on the right-of-way. Mines as a rule are probably working on slightly better time. An increased buying movement on the part of the railroads is the best feature of situation at the moment.

ATLANTIC SEABOARD

BOSTON

Export demand slackens and prices on Pocahontas and New River are thought to be on the point of decline. Only a slim market in prospect. Volume of Georges Creek is steadily increasing. Pennsylvania grades fairly firm. Anthracite demand about even with supply, except in the case of stove size.

Bituminous—The indications are that the spot market for Hampton Roads coals is on the verge of a decline. Coast-

wise, there is practically no business whatever and for some reason the export trade has slackened notably. If this latter continues falling off nothing but the most resolute attitude on the part of shippers can prevent concessions in price in the course of a week or two. For the trade in general such a prospect is disheartening with all the hard work of re-establishing prices, etc., to be done over again. It is not easy to see where any market can be developed in this territory, even at reduced prices, for a long time to come.

In many cases where consumers were ready to buy extra tonnages early in August and their business was then refused by the shippers, particularly from Hampton Roads, they either did not buy at all or they placed orders with Pennsylvania operators. Such business therefore cannot be had now as there is no shortage of Hampton Roads coals.

Georges Creek shipments from Philadelphia and New York continue to improve in volume and not much difficulty is anticipated now in getting forward New England's normal requirements of this grade. Heavy shipments off-shore continue at Baltimore but it is understood that several of the large orders like that of the Greek Government are nearly completed.

There is no new feature in the market for the Pennsylvania grades. Consignees who are fearful of storing summer coal because of possible spontaneous combustion are now accepting deliveries with something like regularity. There are occasional offerings at low prices but for the most part Pennsylvania bituminous is holding firm.

Anthracite—The companies have plenty of September orders now to work on. There is no special delay in shipping, the demand being just about up to the supply on all sizes but stove. Stove is short with most of the companies and schedules calling for more than a third of a cargo are, in some quarters, being flatly declined. There is an active market here for dock screenings but unless the shipments of domestic sizes over the piers increase more than they have lately screenings will continue in short supply.

Current wholesale prices on bituminous are about as follows:

	Clearfields	Cambria Somerset	Georges Creek	Pocahontas New River
Mines*	\$0.90@1.50	\$1.25@1.65	\$1.67@1.77	
Philadelphia*	2.15@2.80	2.50@2.90	2.92@3.02	
New York*	2.40@3.10	2.80@3.20	3.22@3.32	
Baltimore*			2.85@2.95	
Hampton Roads*				\$2.85
Boston†				3.63@3.78
Providence†				3.68@3.73

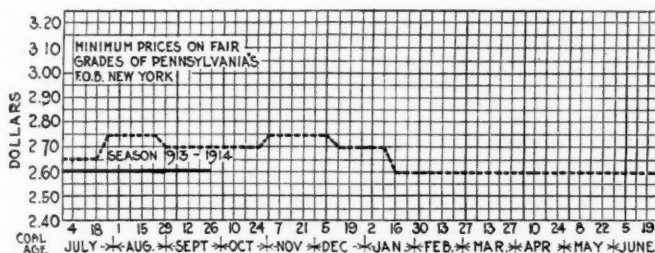
* F.O.B.

† On cars.

NEW YORK

Bituminous weaker. No spot demand and some demurrage coal is noted. Anthracite picking up additional strength as the season advances. Heavy Western demand the latest important development.

Bituminous—There is almost a total absence of spot demand in bituminous coal and the market is perceptibly weaker than it has been in some little time. There is, however, little inclination on the part of the operators to force coal on to this market and the amount of demurrage coal



offering is small and prices are fairly well maintained although, of course, here and there a bargain can be had. The higher grades are, generally speaking, well placed under contract so that low prices are confined almost entirely to coals of fair and poor qualities.

The offshore business continues to ease up and there are few inquiries now in the market for export coal. More vessels

are offering and the heavy tonnages available in England are putting this business back into its former channels. The market on slack is very weak. Quotations continue as follows: West Virginia steam, \$2.50@2.60; fair grades Pennsylvania, \$2.55@2.65; good grades of Pennsylvania, \$2.70@2.80; best Miller Pennsylvania, \$3.10@3.15; Georges Creek, \$3.15@3.25.

Anthracite—Reports from the West show a heavy movement of crops and the farming interests are beginning to realize on the yield. This furnishes them with money to take care of their coal accounts and is being reflected in the increased demand coming in from the retail dealers. This applies more particularly for rail shipments, Lake movement having been quite heavy and stocks in good shape.

The requirements from the West run about 50 to 60% chestnut, about 25% stove and a small percentage of egg. The heavy demand for chestnut in this direction has a particularly good influence as regards the Eastern market just at this time. In the East chestnut is a size which moves principally in small lots to the cash buyer and for immediate consumption in the cold weather. The Western demand is taking the strain off this market so that there is no druggishness in this size here at present. On the other hand, egg seems to be moving slowly and is being stocked by some of the companies. Stove size continues strong and is getting scarcer. It is practically impossible at this time to buy stove from any of the companies at tidewater without an accompanying tonnage of either egg or chestnut.

The retail situation in New York is quiet, the warm weather of the past few days causing a considerable let up in business. Orders continue to come in, however, from rail points in normal quantities for this time of the year and with any advent of cold weather there is no question that the demand on all sizes will easily take care of the supply with a probable shortage on stove.

The fine sizes continue in about the same condition as last week, the higher grades finding a ready market, whereas inferior coals can be had at considerably off circular. The No. 2 buckwheat does not seem to be as strong as heretofore which is rather an innovation as this size, particularly in high grade coals, has been short almost continually for the past year.

The market is now quotable as follows:

	Upper Ports		Lower Ports	
	Circular	Individual	Circular	Individual
Broken.....	\$5.10	\$4.60@5.10	\$5.05	\$4.55@5.05
Egg.....	5.35	5.10@5.35	5.30	4.80@5.30
Stove.....	5.35	5.35@5.40	5.30	5.30@5.40
Chestnut.....	5.60	5.50@5.60	5.55	5.30@5.55
Pea.....	3.55	3.50@3.55	3.50	3.40@3.50
Buckwheat.....	2.80	2.70@2.80	2.50@2.75	2.25@2.75
Rice.....	2.30	2.15@2.30	2.00@2.25	1.50@2.25
Barley.....	1.80	1.70@1.80	1.75	1.45@1.75

PHILADELPHIA

Anthracite trade still showing improvement. Restriction of operations has about ceased. Good fall business anticipated. Bituminous indicates slight improvement over last week.

Anthracite—Judging from reports from all sections of the country, the fall and winter demand will be heavy. Operations at the mines have practically been restored to an all week basis, and unless unforeseen circumstances occur, this will continue for the next four or five months at least. Everything points to a successful October, which is generally one of the banner months of the year, as far as actual consumption is concerned. Optimistic reports are coming from both the retailers and wholesalers, which is in vivid contrast to the pessimistic utterances of a month or six weeks past.

While there is still a tendency on the part of the individual operators to make substantial concessions on the slow sizes, taking the market as a whole, prices are well maintained. The exception is chestnut, figures anywhere from 40 to 50c. less than the established circular having been quoted in some instances. Pea coal is also off circular, but not to the same extent as chestnut. Broken, egg and stove seem to be readily absorbed, and stove, as usual, is short of the market requirements.

Tidewater business, which showed a slight falling off in the early weeks of September, is again picking up, and is felt to be the forerunner of heavy business in the near future. Prices rule about as follows:

	Circular	Individual
Broken.....	\$4.75	\$4.75
Egg.....	5.00	4.90 @ 5.00
Stove.....	5.00	5.10
Chestnut.....	5.25	4.80 @ 4.90

Bituminous—While the demand for bituminous coal shows a slight improvement, prices are unchanged. Tidewater business is more active than the line trade which is still in-

clined to be apathetic. Prices for good coals continue about \$1.35 to \$1.50, with the medium grades from 25 to 30c. less.

BALTIMORE

Slack takes another tumble and demand is generally poor for gas and steam coals. Export trade holds up well. The anthracite business shows strength on domestic account.

Slack during the past 10 days has been sliding, and sales at the West Virginia mines have been made as low as 40c. Run-of-mine coals were offering around 80c., and three-quarter around 90c. Pennsylvania line coals of lower grade were offering below the dollar mark in some cases, while the best grades were to be secured in limited lots at from \$1.25 to \$1.30.

The one feature that holds up well is the export trade. From two to three steamer loadings per day are being made, and the month's total should be a heavy one. Most of this coal is on old contracts, but there is enough new developing in Greece, Italy, Spain, Norway and the Argentine Republic to make it interesting.

Early in the week, a betterment was noted in the hard-coal trade. The domestic business is showing increased activity, and the movement for household use will be quite heavy within the next two weeks.

A distinct lack of coastwise charters Northward is noted. Several vessels were chartered for Tampa, Galveston and other points South. The Northern movement is almost entirely on long-term charters or in company-owned colliers.

HAMPTON ROADS

Dumpings for the week fair. Large cargoes both coastwise and foreign. Accumulation of coal slightly above normal. Prospects for September indicate a record month.

Dumpings at the various piers have shown up fair during the week but it is not believed that the total will compare favorably with the previous week's movement. Some large shipments, however, have been made, both coastwise and foreign, and in addition the government has also taken a fairly large quantity. Export shipments have gone to Genoa, Naples, Cagliari, Valparaiso, Para, Buenos Aires, Kingston, Port of Spain, Dakar and Piraeus.

Prices for New River and Pocahontas mine-run still continue around \$2.85 to \$3 but so far as can be ascertained little coal is moving at the latter figure.

In addition to New River and Pocahontas mine-run there have been a few cargoes of high volatile and nut and slack moving to the New England market. The accumulation of coal at the railway yards is perhaps slightly above normal with tonnage about due which will considerably reduce the supply on hand.

Both the Virginian Ry. and Chesapeake & Ohio are already well ahead of their dumpings for this month when compared with a corresponding period of August, and unless there is some delay to tonnage due between now and the first of October the total dumpings for the month of September should be well ahead of all previous figures for Hampton Roads.

COAL CHARTERS

The "Journal of Commerce" reports: The demand holds steady in several of the transatlantic trades, particularly for grain, petroleum, coal and deal carriers, and rates in all instances are firmly supported at the basis of last previous charters. The requirements of West India charters are apparently well covered for the time being, and there is but little inquiry from South American shippers. Tonnage offers moderately for prompt and forward shipment, with rates ruling about as last quoted. In the sailing vessel market a very limited business was concluded, and there was no improvement in the demand for tonnage in any of the several departments. Rates are low and favorable to charterers, and the supply of vessels is considerably in excess of charterers' requirements.

Coal charters have been reported as follows:

Vessel	Nationality	From	To	Tons	Rate
St. Gothard ²	British	Baltimore	Port Limon	1790	
Glenartney ²	British	Baltimore or Virginia	Buenos Ayres	3309	
Ranvik ²	Norwegian	Baltimore	Buenos Ayres or Montevideo	3332	
Themis ²	Norwegian	Norfolk	Greece	4184	
Confidenza	Italian	Baltimore	West Coast, Italy	2198	
Antares ²	Norwegian	Baltimore	Havana	1104	
Lovisa	British	Baltimore	Jucaro, Cuba	880	
Alice M. Colburn ¹	British	Philadelphia	Ponce, P. R.	1335	\$1.90
Claveresk ²	British	Newport	Havana	2441	
Alice May Davenport ¹		Baltimore	Porto Rico	952	
Childe Harold ¹		Philadelphia	Calais	675	
Pietro ²	Italian	Baltimore	Naples, Savona or Leghorn	2429	
Thyra Menier ²		Norfolk	Chandler, Que.	794	
Flora A. Kimball ¹		Philadelphia	Nassau	321	2.50
Edward H. Blake ¹		Port Reading	Camden, Me.	484	0.65

¹ Schooner ² Steamer

LAKE MARKETS

PITTSBURGH

Slight increase in line trade and buying by retailers but decrease in Lake shipments. Total operations slightly reduced. Prices quite irregular and little new buying.

The local coal situation shows both favorable and unfavorable developments, net balance being unfavorable. The line trade has improved slightly, as compared with a fortnight or 30 days ago, with manufacturing consumers taking heavier shipments. As manufacturing activity has hardly increased it would appear that the change is due to stocks having been still in evidence up to a very few weeks ago. The retail demand has opened up, giving a fresh outlet for coal, and there have been fair shipments to retail dealers for two or three weeks past. The retailers, however, are not taking as much coal as they usually do at this date. The railroad demand is light, and has decreased somewhat.

The Lake trade gives the poorest account. There has been a decided decrease in Lake shipments since the closing days of August. It is true that August showed heavier Lake shipments than July, whereas last year August showed less movement than July, but this year the increase was not large, and the total of August shipments was less than in August a year ago. A rough estimate made by a well posted authority is that the total Lake shipments this year will be about 22,000,000 tons, against 28,000,000 tons last year, the banner year, thus showing a decrease of about 20%. Shipments have been impeded all season by congestion at the Upper Lake docks, the stocks accumulated there last season in anticipation of a prolonged suspension of mining this spring having been moved very slowly.

Mining operations in the Pittsburgh district do not average over 60% at the outside. Prices are irregular and are not closely quotable as there is no contracting and not a great deal of selling of free coal. In general mine-run is not much above a dollar a ton for prompt lots, slack being 50 or 60c. Circular prices for the season are: Slack, 90c.; nut and slack, \$1.05; nut, \$1.25; mine-run, \$1.30; $\frac{3}{4}$ -in., \$1.40; $1\frac{1}{4}$ -in., \$1.50.

BUFFALO

Slack continues to depress the market. Railroads holding off are also adversely affecting the situation. Canada proposes a moratorium. Anthracite holding strong.

Bituminous—Some of the shippers are inclined to report a better market, but with slack so heavy it is difficult to see anything satisfactory in the trade as a whole. Estimates place the possible fall increase at 20% as compared with 30 or 35% normally. There is at least no present prospect of an advance in prices. The attitude of the railroads is adverse to any improvement. They will not buy a pound of coal where it can be avoided and they are crying poverty so persistently that everybody is affected.

The falling off in the slack trade is thought to be temporary, as there will soon be a big increase in the consumption. There is complaint from the anthracite shippers that the special demand for screenings has dropped off and coke taken up instead; if this is the case screenings will again be used for mixing with slack to make smokeless city fuel; this should make both more active soon. The proposed Canadian moratorium will be taken by all shippers as a confession of inability to pay debts and coal shippers will be still more cautious about selling that market.

The prices of bituminous are weak, but the circular has not been laid aside, some of the best Pittsburgh grades still commanding \$2.80 for lump, \$2.70 for three-quarter, \$2.55 for mine-run and \$2.15 for slack, with Allegheny sizes about 25c. lower. One reason for the slow sale of slack is that some consumers are finding a good grade of three-quarter that they consider cheaper.

Anthracite—Shippers with a good supply of anthracite regard themselves as fortunate as the demand has set in strong enough to cause premiums on stove. As a rule everybody is short of this grade. So much coal was sent in some other directions that only 82,500 tons were loaded for Lake shipment during the week. There is some difference of opinion to the needs of the upper Lake docks; some shippers believe that they have about enough there, while others are eager to fill up all available space made by current sales, which are reported good. There will be some caution about shipments to Canada, but as a rule shippers feel that they will be able to arrange for regular payment in spite of the unsettled conditions there.

COLUMBUS

Domestic grades continue heavy and will be a weather proposition from now on. Lake business the only active department. Steam coals slowest in years.

With a slackening in the demand for domestic sizes, due to higher temperatures, a slowing down in steam trade and an active Lake business, the coal trade in Ohio has been almost at a standstill during the past week. Notwithstanding these bad features the tone of the trade has been satisfactory and future prospects are not altogether bad.

The Domestic Trade is largely a weather proposition at this time as the stocking-up season is about over. As a result orders from now on will depend largely upon the temperature. Prices on the whole have been well maintained despite the unfavorable weather.

Lake Trade still retains its activity and a considerable tonnage is moving to the Northwest. Chartering is going on actively and there is a good supply of vessels. Docks in the Upper Lake ports are sending coal to interior points and are thus free from bad congestion.

The Steam Trade is the slowest in years. Manufacturing establishments are not requiring as much fuel as formerly and many have resorted to buying on the open market, rather than to enter into contracts. Railroad fuel business does not show any increase. Many of the larger railroad contracts are still open and the indications are good for a continuation of this condition.

Production in various Ohio fields during the past week has declined to a certain degree. Reports from Hocking Valley district show the output to have been about 75 to 80% normal. In the Pomeroy Bend field the output is about 90% and in other fields about 75%.

Prices in Ohio districts are:

	Hocking Valley	Pomeroy	Kanawha
Re-screened lump.....	\$1.70	\$1.75	
Inch and a quarter.....	1.60	1.60	\$1.50
Three-quarter inch.....	1.45	1.45	1.45
Nut.....	1.15	1.50	1.15
Mine-run.....	1.15	1.15	1.15
Nut, pea and slack.....	0.30	0.35	0.30
Coarse slack.....	0.20	0.25	0.20

CLEVELAND

Market remains inactive. Current receipts small, but too large for immediate consumption. Orders in the Lake trade have been reduced by leading shippers.

While a few local factories are working only part time or not operating at all, there are some working night and day to supply increased trade due to the European war. The automobile plants, carbon works and clothing industries are very busy, but use comparatively small amounts of fuel. The blast furnaces and steel mills are doing more than they have for a month. Coarse coal is not moving. Nut and slack are readily placed, but pea and bug-dust are refused by the consignees.

Lake Shipping was ordered reduced by shippers who find they will be unable to handle the coal at the upper Lake docks. Large boats of the 10,000-ton class are accepting cargoes to ports where unloading is a matter of a week. Boats of 3000 and 4000 tons usually go to these ports, but the ship managers are so hard up they will carry anything. Freight rates have not been cut.

Prices for current shipment are as follows:

	Pocahontas	Youghiogheny	Bergholz	Fairmount	W. Va. No. 8
Lump.....	\$3.60				
Lump, 6 in.....			\$2.45		
Egg.....	3.60				
Egg, 6 in.....			2.10		
Lump, $1\frac{1}{4}$ in.....		2.40	2.20		
Lump, $\frac{3}{4}$ in.....		2.30	2.10	2.00	2.05
Mine run.....	2.75	2.15	2.00	1.90	1.95
Slack.....	2.40	1.55@1.60	1.55	1.50@1.55	1.50

CINCINNATI

Bad market conditions have spread to the domestic trade. Prices are weakening badly, and while there are some signs of betterment, immediate improvement is improbable.

The poor demand which has been noted in the steam market is now in evidence among domestic consumers and dealers as well. The industrial situation remains poor. Prices have shown signs of a collapse on both sides of the market, concessions being freely offered all around. Nut and slack have been practically given away, in many instances, for several weeks, but heretofore the domestic grades have held firm. That they have now given way to some extent is good evidence of the pressure on the trade. Indications are not lacking, however, that the industrial situation will improve within a few weeks, and that a like improvement may be looked for in the coal industry.

COKE

CONNELLVILLE

Coke market absolutely stagnant, with consumption decreasing and no occasion for any new purchases, so that prices are practically nominal.

The Connellsville coke market is absolutely stagnant. Consumption is decreasing rather steadily and furnaces in operation are well covered by contracts, on which shipments tend to be excessive rather than otherwise, so that there is no contracting and no demand for prompt furnace coke. The foundries are mining somewhat lighter and foundry coke is also stagnant. Prices are practically nominal, former quotations having been: Prompt furnace, \$1.65@1.70; contract furnace, \$1.75@1.90; prompt foundry, \$2.25@2.35; contract foundry, \$2.35@2.50, per net ton at ovens.

The "Courier" reports production in the Connellsville and lower Connellsville region in the week ended Sept. 12 at 250,955 tons, a decrease of 16,915 tons, and shipments at 255,865 tons, a decrease of 14,445 tons.

BUFFALO

It is still considered odd that the iron ore receipts by Lake are so large while the ore trade continues lifeless. It appears from these apparently conflicting reports that ore is going into consumption, while at the same time the consumer is in control of the price of coke. Quotations remain as before, on the basis of \$4.25 for best 72-hour Connellsville foundry and \$3.30 for stock coke.

BIRMINGHAM

There is no change in the coke market this week, the production being far in excess of the requirements, though prices remain about the same.

SOUTHERN

BIRMINGHAM

No large shipments being made but some tonnage is being exported. Lump coal rather quiet. Furnaces report heavy sales of pig iron.

The demand for steam coal is unchanged though many of the operators state that business has been better. While none of the large tonnages wanted for South American trade have been moved, several shipments of smaller size have been made. One steamer left this week for South America with 2900 tons of coal, and it is understood that another cargo of 7000 tons will leave either Pensacola or Mobile this week. Details regarding charters and finances for the larger export business have not yet been definitely settled.

Lump coal is just about the same as last week, with the production a little larger than the requirements. Blacksmith coal is in a satisfactory condition. Pig iron manufacturers report heavy sales and shipments of iron far exceed the production.

LOUISVILLE

Domestic sizes in good demand but the market is still glutted with the steam grades. Prices unchanged.

The demand for domestic coals is heavy but the retail dealers report they are not doing the business they would like to. Crops are much better than expected and the interior sections will take larger quantities of domestic coals than was anticipated.

The market is glutted with steam sizes, however, and there are large quantities on demurrage, with little in the way of immediate prospects for improvement in the demand. Labor is plentiful and there are some operations running on full time, with markets for all the coal they can produce.

Prices are virtually unchanged except as to the steam sizes, on which cuts are readily made.

MIDDLE WESTERN

INDIANAPOLIS

Larger movement of freight creates a stronger demand from the railroads. Both steam and domestic consumers doing some stocking. Mines working fuller.

The weather is not favorable to an increased coal trade, yet the retail yards of the state have been ordering the

domestic grades freely, apparently in anticipation of the colder weather ahead. There has also been some accumulation by industrial plants for a like reason. Probably the most important feature in the trade now is the improvement in the demand from railroads. This is supposed to be due to the better ocean shipping which has started a larger movement of flour, grain and other commodities to the Atlantic and Gulf ports. Mines are running fuller and a good percentage of the larger operations are on full time. The screenings situation has not improved and low prices prevail in the open market; on this account prices on other grades are held stiffly. Retail prices are unchanged and the movement from the yards is about normal for the season. There are indications of improvement in the industrial situation.

ST. LOUIS

Advance in high-grade domestic coals has developed to spectacular proportions, but the steam coals have suffered a similar decline. Screenings can be obtained for the cost of the freight.

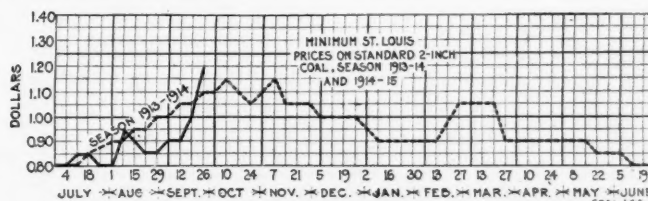
As has been predicted, the high-grade domestic market has experienced a spectacular advance, and the steam trade has gone to pieces. In the Standard field screenings are being given away for the freight, and there is no demand for lump at the price that the operator must have. Failure to move the smaller sizes in the high-grade field has brought about such a congestion at many of the mines that the railroads will not allow them to work until the surplus coal has been sold. This has reduced the working time from five and six days a week down to two days, and the lump and egg produced is not sufficient to care for the contracts alone, in addition to which there is much in the open market already sold. The result is that some mines are still behind on their August shipments of lump and egg, and it is almost impossible to buy these grades for prompt shipment on the open market.

The washed market is good, as far as sizes Nos. 1 and 2 are concerned, but the other grades are dragging. Screenings are down to 20 and 25c. In a general way conditions in the steam market will not improve until colder weather sets in, with a demand for the smaller sizes. There is no hope at all, to bring about a change as far as manufacturing interests are concerned.

In the Standard field the situation is absolutely hopeless. One or two operators in the Williamson County field are already storing their steam sizes close by.

The prevailing circular is:

	Williamson and Franklin Co.	Big Muddy	Mt. Olive	Standard	Sparta
2-in. lump.....			\$1.30	\$1.20@1.30	\$1.25
3-in. lump.....			1.40		
5-in. lump.....	\$1.75@2.00		1.50	1.35@1.50	1.50
Lump and egg.....	1.85@2.15	\$2.25			1.15
No. 1 nut.....	1.40@1.60			0.75@0.80	
Screenings.....	0.70@0.75		0.80@0.85	0.05	0.10@0.15
Mine-run.....	1.05@1.10			0.75@0.80	
No. 1 washed nut.....	1.50@1.65	2.25	1.50		
No. 2 washed nut.....	1.25@1.35		1.35		
No. 3 washed nut.....	1.05@1.10				
No. 4 washed nut.....	0.50@0.60				
No. 5 washed nut.....	1.10@1.15				



KANSAS CITY

Trade very quiet, the volume falling considerably below normal. Prices are mostly unchanged.

Retail coal trade in Kansas City showed a decided falling off last week. Reasons ascribed are the warm weather which revives recollections of the warm fall last year, and the continued uncertainty as to whether prices will rise materially. Severe storms hampered shipments, but the situation was relieved by the comparatively light demand. Some of the block coal producers have delayed longer than usual in beginning fall operations, and even at that are said to be ahead of the demand. Prices on block coal have advanced 10c. at the mines, but locally are unchanged.

The market is quotable as follows:

	Wholesale	Retail
Block coal	\$2.50	\$3.75 @ 4
Nut	2.70	3.75
Mill	2.30	3.25
Slack	2.05	3
Semi-anthracite slack		3.75
Semi-anthracite	5.00	6.00

PORTLAND, ORE.

High wood prices expected to increase the demand for coal. Car shortage developing. No coal expected by way of the Panama.

The outlook for this winter is brighter than for some time, that is providing coal will be obtainable without serious delays in transportation. Slab wood is higher than usual this year which is causing an advance to a price where coal will be found cheaper. Many are now placing orders for coal.

Grain is now moving steadily from the interior to the wharves here and on Puget Sound and as a result the railroads are not able to furnish cars promptly.

It is hoped here by the trade that prices will not advance as reasonable coal prices would give them opportunity to introduce coal and gain steady customers who heretofore have favored wood fuel.

PRODUCTION AND TRANSPORTATION STATISTICS

SAULT STE. MARIE CANALS

Coal shipments through the Sault Ste. Marie Canals for July and August were as follows:

	July			August		
	U. S.	Canal	Total	U. S.	Canal	Total
Anthracite	375,127	56,066	431,193	238,952	54,107	293,059
Bituminous	1,580,950	287,200	1,868,150	1,808,341	275,440	2,083,781

PENNSYLVANIA R.R.

The following is a statement of shipments over the P. R.R. Co.'s lines east of Pittsburgh and Erie for August and eight months of 1913 and 1914, in short tons:

	August		Eight Months	
	1914	1913	1914	1913
Anthracite.....	805,585	713,451	7,153,407	6,851,626
Bituminous.....	4,299,810	4,562,339	31,821,349	33,396,286
Coke.....	792,656	1,161,484	6,867,676	9,731,462
Total.....	5,898,051	6,437,274	45,842,432	49,979,374

NORFOLK & WESTERN RY.

The following is a statement of coal handled by the N. & W. Ry. during August and the past four months of the current year in short tons:

	May	June	July	August
Pocahontas Field.....	1,239,653	1,245,440	1,314,478	1,277,621
Tug River District.....	263,155	244,342	263,240	293,179
Thacker District.....	280,148	261,248	288,643	286,572
Kenova District.....	101,768	97,352	100,600	105,724
Clinch Valley District.....	150,916	156,028	140,751	134,408
Other N. & W. Territory.....	2,596	2,337	2,735	4,211
Total N. & W. Fields.....	2,038,236	2,006,747	2,110,447	2,101,715
Williamson & Pond Creek R.R.....	74,875	76,822	90,819	91,813
All other railroads.....	225,561	232,387	301,796	257,280
Grand total.....	2,338,672	2,315,956	2,503,062	2,450,808

Distributions of shipments for July and August compare as follows:

	July			August		
	Shipped	Tipple	Total	Shipped	Tipple	Total
Pocahontas.....	1,212,483	16,138	1,228,621	1,208,245	14,573	1,222,818
Tug River.....	260,141	3,099	263,240	289,223	3,956	293,179
Thacker.....	235,410	7,633	243,043	232,234	9,377	241,611
Kenova.....	89,953	10,647	100,600	94,494	11,230	105,724
Total.....	1,797,987	37,517	1,835,504	1,824,196	39,136	1,863,332

Shipments of coke, entirely from the Pocahontas field, amounted to 58,266 tons in August as compared with 62,097 in July.

CHESAPEAKE & OHIO RY.

The following is a comparative statement of the coal and coke traffic from the New River, Kanawha and Kentucky districts for July, 1913 and 14, in short tons:

Destination	July		July	
	1914	%	1913	%
Tidewater.....	262,060	15	238,638	17
East.....	186,613	10	191,791	14
West.....	1,218,181	68	866,872	62
Total.....	1,666,854		1,297,301	
From Connections				
Bituminous.....	133,497	7	93,402	7
Anthracite.....	878		1,571	
Total.....	1,801,229	100	1,392,274	100
Coke.....	25,033		29,945	

FOREIGN MARKETS

GREAT BRITAIN

Market feeling the effects of the curtailed output. Consumption and exports are heavily reduced.

Supplies are coming forward with greater regularity, and the traders are better able to deliver the arrears of coal on order. The low-priced offers to the Government have had a considerable influence upon public orders, and little new trade has been entered into lately.

The market is seriously affected by the restricted output, especially with the house coal collieries, for in many cases working is down to four days per week, and some less than that. Fortunately, however, the weather continues unusually warm, and the actual coal consumption is at its lowest minimum rate. The reports from the collieries all point to a distinct curtailment of labor during the coming winter, arising from the enrollment of so many men willing to serve in the war, and this enlisting is still going on, so that the short-handed feature of colliery labor is likely to become more acute as winter advances.

There are some, however, who prophesy that the export trade is so terribly crippled and is felt more keenly in the North, that there must shortly be a large number of the Durham collieries close down, whilst Yorkshire and Lancashire collieries will endeavor to find home markets for their output, even at reduced prices; and men from these districts are not unlikely to remove into the Midlands, where work is not so much affected by the cessation of the export trade.

Many of the factories along the Thames side—especially those who are dependent upon the import trade for the raw material—have either closed down, or are working very short time. But in other cases, where local industries have been required either for war material or to do with fitting up the various transports, the factories are working at high pressure.

The shipping danger has seriously crippled the oversea trade. Local consumers are taking contract supplies, but producers report a somewhat heavy stock on hand. The same may be said of the North Country coal trade. The demand is good, and especially for the Mediterranean coaling ports, but the difficulty of getting the cargoes safely away is causing a number of steamers to lay up. Freights are nominal, and contract boats and neutral tonnages are easily obtainable at very low rates. Strangely enough, the Humber ports return a very satisfactory tonnage. The market, however, is very quiet, largely on account of the uncertain condition of affairs in the North Sea. The South Wales coal is still largely held by government, and only a comparatively small quantity is available for ordinary sale on the open market.—"The Colliery Guardian."

British exports for August and the first eight months of the past three years were as follows:

To	August		Eight Months	
	1912	1913	1912	1913
Russia.....	674,546	769,794	169,353	2,515,825
Sweden.....	510,549	379,475	198,347	2,363,262
Norway.....	208,641	154,887	253,467	1,361,256
Denmark.....	282,101	248,746	243,019	1,687,562
Germany.....	866,437	798,177	132,026	5,213,106
Netherlands.....	183,044	168,862	165,296	1,182,927
Belgium.....	130,629	148,132	31,727	928,704
France.....	862,099	946,378	562,783	6,269,568
Portugal.....	108,438	95,924	77,729	769,282
Spain and Canaries.....	264,492	259,847	172,578	2,132,394
Italy.....	850,129	665,618	444,779	5,693,589
Austria.....				
Hungary.....	83,855	64,286	17,602	485,948
Greece.....	81,612	36,080	29,353	410,776
Roumania.....	19,271	23,283	14,437	114,075
Turkey.....	45,155	24,787	41,456	262,544
Egypt.....	363,314	196,796	161,645	1,890,731
Algeria.....	88,723	116,754	28,647	615,961
Portuguese West Africa.....	17,187	13,390	15,013	201,136
Chile.....	38,863	21,039	17,720	447,605
Brazil.....	145,284	111,504	48,983	985,318
Uruguay.....	91,892	72,006	39,103	516,842
Argentina Republic.....	312,387	290,741	98,344	1,965,859
Channel Is.....	21,235	16,004	11,354	114,950
Gibraltar.....	18,604	29,161	15,544	218,092
Malta.....	35,832	39,292	19,418	231,846
Aden and Dependencies.....	30,491	17,684		138,371
British India.....	9,614	10,057	1,646	82,666
Ceylon.....	12,795	7,037	5,232	152,292
Other countries.....	100,456	93,421	54,141	720,356
Coke.....	108,948	113,423	68,498	583,034
Total.....	6,729,653	6,072,863	3,209,399	41,246,156
Bunker.....	1,850,346	1,749,847	1,147,437	11,608,744
Total.....	8,579,999	7,822,710	4,356,836	52,854,900

Includes Azores and Madeira. Including Anglo-Egyptian Sudan.